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METAL INDUSTRY is Published monthly by The Metal Industry Publishing Company, 116 John Street, New York, N. Y., U. S. A.
Entered as second class matter February 25, 1903, at the Post Office in New York under the Act of March 3, 1879.
Volume 36, Number 1, January, 1938. Two Dollars Per Year.

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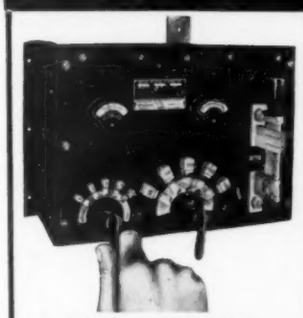

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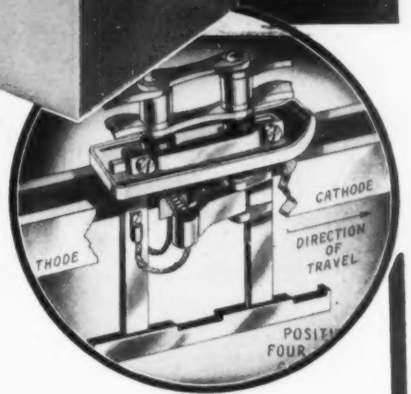

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METAL INDUSTRY

JANUARY, 1938

VOLUME 36 **NUMBER**

Publication Office:
116 John Street, New York

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PUBLISHED MONTHLY—Copyright 1938 by The Metal Industry Publishing Company, Incorporated, 116 John St., New York, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1897.

SUBSCRIPTION PRICES: United States and Canada, $2.00 Per Year; Foreign $4.00. Single copies, 20 CENTS. Please remit by check or money order; cash should be registered.

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METAL INDUSTRY

VOL. 36, NO. 1 FABRICATION · ASSEMBLING · PLATING · FINISHING JANUARY, 1938

EDITORIAL

Guaranteed Plating

Over a generation ago when durability was considered the most vital element of value, a firm of flatware manufacturers made its name by advertising the "twenty-year plate." Today we are told that this type of sales argument no longer has the same power. The largest consumer product—the automobile—is sold with the clear understanding that it should be replaced in three or four years. Consequently there is no point in putting a 20-year plate on any of the parts. And this attitude seems to have carried over to a large number of other products, not unnaturally, because of the enormous influence of the motor industry.

Nevertheless, distributors realize that a very respectable proportion of the public is still interested in stability as well as appearance. Perhaps there is something of a swing back. Plating especially has been so badly abused. It is so easy to produce a beautiful surface with insufficient undercoating, and the fundamental weakness of the work becomes evident only after the customer has had the article in use.

One of the results of this swing was the movement toward specifications for plating work. But even these specifications are not completely adequate. They are based only on thickness and thickness alone does not make a plate perfect. There are the other factors such as density and crystal structure which are dependent upon the conditions in the plating bath, current density, the quality of the anodes, etc.

Fundamentally the plater wants to produce quality work. Faced as he is by intensive price competion he still does the best work that he can, within the limits allowed him. Occasionally, by progressive buyers, he is allowed wide latitude advising on the best type of work for the specific job involved; the type and thickness of undercoatings, etc. He may plate to specifications, that is thickness. But where he is asked for guarantees of definite life, the job becomes risky. With no control over the type of use, or abuse, in the hands of the ultimate consumer; with no control over the locality in which the article is to be used; in fact with no control over anything except his own work, a guarantee is practically an invitation to have the work done over. Only by charging a price which may seem outlandish, can he afford the gamble involved. The price must cover not only the best grade of plating job but it must also cover an unknown percentage of rejections and returns for the whole duration of the guarantee.

The job directly ahead of the industry is full steam ahead on specifications; more in number and more detailed in substance. Some day we may have enough data to be able to tackle the problem of guarantees, for specific objects, specific uses in specific localities and under specific conditions.

* * *

Resolutions for the New Year

In the interests of the well-being of American industry — including all who are dependent upon it; with no thought of political partisanship—METAL INDUSTRY suggests that the Government and Business make and live up to the following resolutions for the New Year.

Government

1. Strike off the shackles now on Business; the onerous and punitive taxes.
2. Exert every effort to balance the national budget at the earliest possible date.
3. Forget *Political* considerations and concentrate on the immediate job ahead—*Economics*—the improvement of business and industry.
4. Give our lagging industries—building, railroads and utilities—a chance for profits—and watch unemployment drop.

Business

1. Keep our presence of mind. There is no panic. Wall Street is not a true index of actual conditions.
2. Propose specific, concrete measures to the Government to aid industry. Offer constructive cooperation, not merely destructive criticism.
3. Expect no miracles in 1938 and avoid disappointment.
4. Buy raw materials for reasonable current needs. Never speculate (either on the long or short side) with the foundation of business.
5. Keep plant and equipment modern and up-to-date in order to manufacture at the lowest possible cost.
6. Sell products with every ounce of energy on the basis of the best quality at a fair price.

To Both Government and Business

Stop bickering and mud-slinging. Never mind "who started it." Pull together and we'll all go ahead.

The Manufacture of Precious Metal Plate for Jewelry

The production of rolled gold plated wire, tubing and flat stock.

By **GEORGE FIFE**
Manager, Union Plate & Wire Co., As told to FRANCIS A. WESTBROOK.

THE Union Plate and Wire Company is one of the units of the Associated Attleboro (Mass.) Manufacturers and has been in business in Attleboro for a great many years. Its product consists of rolled gold plated stock in sheet, strip, tubular and wire form. While finished consumer goods are not made here the supplies as furnished to customers in many instances leave little to be done to them but assembling. The tubing is used for such articles as pencils and pens, bracelets and other jewelry, the flat stock is used for findings in the jewelry business and the wire for a very great variety of products. Wire and tubing, especially, are embossed with designs by engraved tools in large numbers. That is, there are in the tool room rolls for over 6000 designs for fancy wires and over 3000 for tubing.

The gold alloys are compounded in the gold room according to whatever particular formula is wanted by the customer. The ingredients are then taken to the melting department where the melting is done in ceramic-ware crucibles in gas fired furnaces. There are four of these furnaces, each being equipped with hoods connected with an exhaust system to carry off the fumes arising from the boracic acid flux. The molten metal is poured into ingot molds from ¼ to 1" thick, depending upon the alloy. The ingots are practically always melted over at least once more to make sure of getting a proper mixture.

The ingots are taken to the large breaking down rolls for the first step in processing. This is a 14" x 14" rolling mill, driven by a 75 h.p. motor with reduction gears. For flat pieces the ingot is next taken to the 8" x 10" rolling mill in which it is reduced to the size desired before going to the plating department.

Fig. 1. *Rolling Department. Gold and silver plated sheet being rolled to desired thickness, within* 0.0005" *plus or minus.*

Flat Work Department

Gold plating is an interesting operation which has been very carefully worked out and well standardized. The gold alloy is soldered to the base metal with silver solder and a borax flux. The materials are held in Plater's clamps, with the base metal bar on the outside, the solder in the form of a sheet on this; then the gold alloy, a covering of soft asbestos over this to take up any unevenness in the gold alloy and on top of this a piece of heavy metal which is flat, such as cold rolled steel. With the metals thus held firmly in place the plating is done in a Plater's furnace which has three gas burners which are separately adjustable in order to secure even heating with an even flow of solder. The average heating time is 7 minutes, with 8 minutes for the largest pieces.

When this plating operation has been completed the bars are taken back to the breaking down roll. The base metal bars average about 1" thick and they are broken down after plating to about five times their original length in this mill. The gold face of the bar is then covered with yellow ochre to keep it from burning during the annealing which follows. This is done in a gas furnace in a dark place so that the color may be accurately observed. Of course the men who do this are experienced and highly skilled and they are capable of reaching a red heat (indicating a temperature of about 1100°F.) with great exactitude. This is safe as the melting point of the silver solder is about 1500°.

After annealing the bar is rolled again, this time in the 8 x 10 rolls down to .035″ thick. These rolls are equipped with a wind blast to blow off all dust and foreign matter which might tend to leave any marks on the rolled surfaces. This is followed by electrical annealing, also carried out in a dark location so that the color of the heated metal may be seen. As in every annealing operation the plated surface is coated with the yellow ochre.

Final rolling, down to .030″ and even to .006″, is done on one of the several 3½″ x 5″ rolls, which are provided with polished steel rolls to give a mirror finish. This will be given a final electrical annealing if the customer wants soft stock.

Tubing Department

The first step in making tubing consists of producing a piece of gold plate by the processes already described, and then rolling it into a square large enough to get a blank 7½″ in diameter by .110″-.115″ thick. This square is made by cross-rolling in the large breaking-down roll because the larger the roll the flatter the blank will be. The tube is started with this blank.

There are three draw presses equipped with dies for forming the tubes. Each piece is put through six dies on the first press which brings it down to 3½″ diameter. On the second machine each piece is successively put through eight dies which brings it down to 1½″ in diameter, so far without change in wall thickness. The third press has a long draw and is used to change the thickness of wall by reducing the diameter down to 1″ in three or four dies. The pieces are annealed during the drawing processes after every other draw in gas fired furnaces and come out black. It is consequently necessary to give them a pickling in dilute oil of vitriol after the drawing has been completed in these presses.

The tubes then go to the breaking-down draw boards where they are brought down to about ⅝″ in diameter and 6½′ long, in six draws and two anneals. The outside, or plated surface is covered with the yellow ochre for these, as well as subsequent annealings.

Finish drawing comes next, for which there are some twenty tables available. Steel dies are used for the last drawing to insure accuracy in size and the high finish which is desired. Drawing is, of course, done over a steel arbor to keep the tube from collapsing, and there is an anneal after every third passage. Many of the tubes are engraved with a design according to the customer's requirements, and this is done on the regular draw boards with turks heads with interchangable rolls for every design.

Fig. 2. Tubing Department. Tubes reduced in size on draw-benches.

Fig. 3. Tool Room. Rolls and tools are shaped and engraved for embossing wire and tubing.

Wire Department

The outside gold plated shell of the wire is made like the tubing, through to the third large press. A sheet of silver solder covered with flux on both sides is inserted in this shell and the core of base metal is next pressed into place. The shell is then soldered to the core in a gas fired furnace in which the piece is rotated in order to make sure of even heating and melting of the solder at every point.

Swedging is the next step. There are several sizes of swedging machines by means of which the pieces may be drawn down to ⅜″ or ¼″ in diameter. They are annealed every three or four times.

Regular wire drawing machines are used for the final drawing down. For sizes below No. 10 A.W.G. stranding machines are used of which there are six available and on which wire as small as .002″ or even .001″ can be drawn. In many instances the wire is finished with a square cross-section which can be made as small as .016″ on the side, or it may be rolled flat. Designs are engraved on it similarly to tubing, with a turk's head.

Flat stock may be cut into strips on the gang cutter and the narrow flat strips, of which bracelets are made, for instance, are engraved on rolls by the designer for the company.

Jewelers' Laps

Q.—Can you tell me what metals are used to make jewelers' laps? These we use are about 10 inches in diameter and ¼ inch in thickness, and are used for putting a flat finish on medals, rings, links of chains, etc.

A.—Different metals are used to serve different purposes. Thus, a leading supply house will provide lead laps, tin laps, "composition" laps, and cast iron laps; the first mentioned being the softest, the cast iron being the hardest. When ordering laps, it is wise to describe fully the type of work that is to be done.

The "composition" mentioned above is probably an alloy of about two parts tin to one part lead, plus a little copper or antimony.

Within recent years there has been considerable research conducted on lead and its alloys, and it is possible that if you are dissatisfied with the laps you are using, it might pay you to get in touch with the research and development department of one of the large lead manufacturers. A wide range of hardness can be obtained by means of various alloying elements.—JEWELRY METALLURGIST.

From Working Clothes Buttons to Modern Novelty Finishes

The Patent Button Co. products cover this unusual range. Development over a period of 90 years.

IN THE early part of the nineteenth century, Alfred Platt left the Benedict and Burnham Manufacturing Company to buy from his father a Grist Mill located on the rapids of the Naugatuck River between Naugatuck and Waterbury, Connecticut. The Grist Mill went along in its own dull way, and Alfred Platt turned to his first love of metal fabrication as a side line. He started a factory to make "metal attached" buttons for overalls, the first button of this type to be made in the country. He employed his two sons, William S. and Clark M., and on reorganizing the business in 1847 under the name of A. Platt and Company, he took the two boys in as partners. Later the Company branched into the rolling of zinc. In 1876 it was decided to separate the two branches of the business and The Patent Button Company was formed.

From then on The Patent Button Company continued developing improved methods and machinery for manufacturing and attaching Patent Buttons. The business grew through the years with the increase of population and the vastly increased use of overalls.

In 1925 a building of the latest design was erected to take care of a new development. After a search of the shirt industry the Company saw there was a definite field for an unbreakable, light, and economical "sew-on" button. To solve this problem The Patent Button Company designed an aluminum button that answered all three requirements.

But it was found that the fabrication of the aluminum button was not enough. To make it attractive to the trade it was necessary to finish it with colored enamels. The best material available at the time was the nitrocellulose air-drying lacquer. While this met the requirements of color and durability according to the standards of the times, The Patent Button Company was not satisfied that this was the final answer. They established a laboratory for the purpose of developing a material more durable, economical and attractive to the eye. After several years of extensive research they developed synthetic resin enamels in their laboratory that answered all their requirements. Not only did this new material enable them to finish the button more economically for their clients, but also the appearance was greatly improved and the finish itself could stand much more severe laundry tests than were ever thought possible.

The development of these synthetic resin enamels, which are basically composed of so-called plastic materials, showed the company the possibilities of the actual molding of buttons. After considerable research in materials and methods of production, a molding factory was established in Knoxville, Tennessee in 1933. Thus were added to the business two considerable fields of endeavor which are growing in size and experience.

The synthetic enamels gained such a reputation for their appearance and quality that other metal fabricating concerns were interested in having The Patent Button Company finish many of their products for them. To take care of this demand it was necessary to design and build machinery for spraying lipsticks and vanity cases. The work was so satisfactory that the Engineering Department began developing more novel methods of application. One development was an economical process for stenciling vanity tops. Another was a machine for filling impressions in various articles. The most outstanding, however, was a banding operation which was developed to such a point that all kinds of multi-colored designs could be put on a shell as economically as it could be sprayed. This equipment not only provided a great range in the type of work that could be done but also provided for large production at low cost. Typical of the articles finished by The Patent Button Company service were various parts of lipstick cases, vanity boxes, cigarette lighters, flashlight cases of various sizes, bottle caps,

Fig. 1. A corner of the laboratory of the Patent Button Co., used for control tests on raw materials, work in production and research on new materials and processes

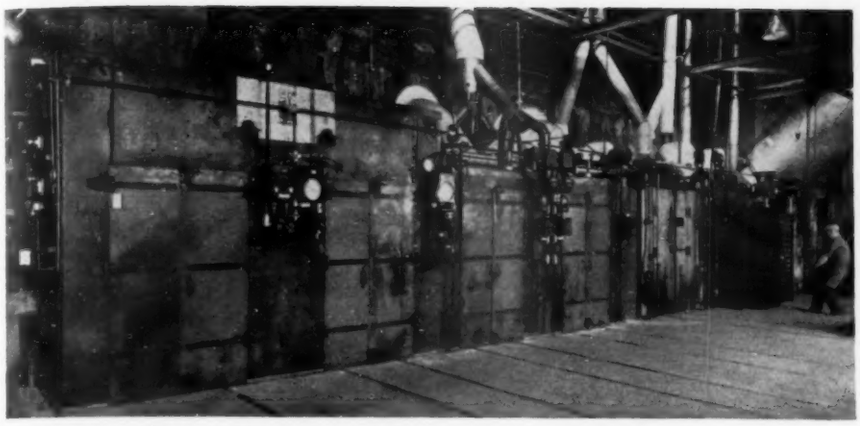

Fig. 2. A row of delicately controlled ovens in which bulk work is finished.

powder boxes, pencil tips, cigarette boxes, and ash trays.

The Patent Button Company's knowledge of synthetics was applied to the bulk finishing operations used in finishing various parts of the metal attached Patent Buttons, such as those that have ornamental designs depressed in the face of the button and filled with color. Buttons of this character are attached to garments that undergo severe laundry treatment and are exposed to actual wear, to acid fumes and other fumes in many lines of industry. The quality of the material used for this bulk finishing purpose has been developed to such an extent that while not quite absolutely impervious to all the treatments received, they are so nearly so that the garment manufacturers have adopted this type in greater volume over the past few years. In conjunction with the development of the material the Engineering Department worked out such efficient and novel methods of application that The Patent Button Company is one of the leading concerns in the country in bulk application. The variety of treatments and the variety of the articles that can be handled by this method of finishing have been tremendously extended.

Contrary to what might be generally expected, while The Patent Button Company formulates and manufactures all of these enamels, they do not sell them in bulk but use them strictly for application in their own plant. This has created a relationship between their clients of the Novelty Finishing Department and themselves that is of great value to both.

First it is more economical for The Patent Button Company to apply the enamel in their own plant rather than to sell it in bulk, because their knowledge of its use, their years of experience in controlling it, and the novel equipment they have developed enabled them to apply it more cheaply and efficiently than could be done in any other way.

Furthermore, the facilities and experience of the Laboratory and Engineering Departments are always at the clients' service for developing new types of finishes and new methods of application to answer problems that are continually arising in various fields.

Thus the organization that started with A. Platt's Grist Mill on the rapids by the Naugatuck River has developed so that it embraces diversified lines of manufacture, which include various types of metal buttons, plastic buttons, and the formulation and application of synthetic enamels. In all these fields they can conservatively claim origination and subsequent leadership.

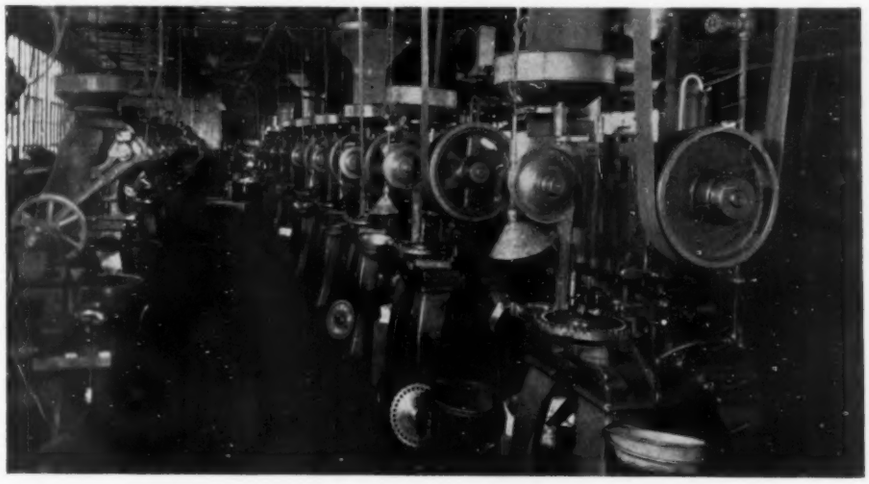

Fig. 3. Machines for forming button parts.

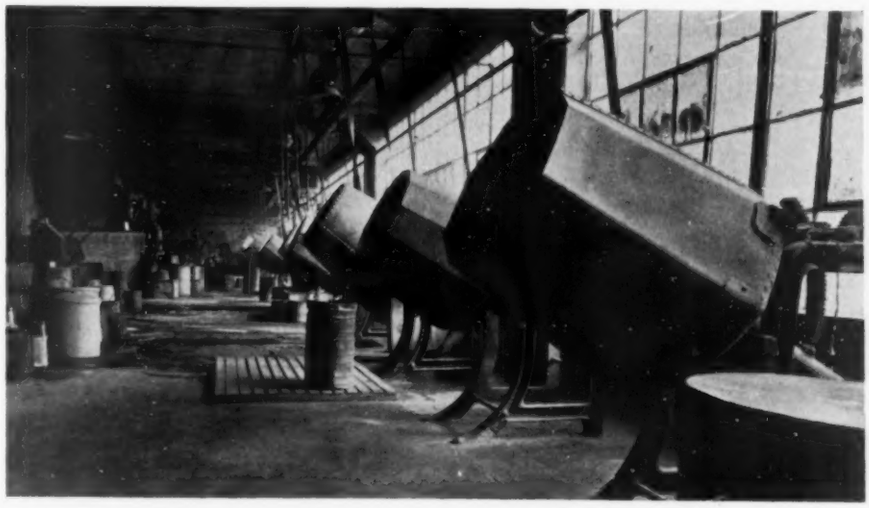

Fig. 4. A line of tumbling barrels in the plating room.

Methods of Joining Copper Alloy Products. Part 4: Tubes, etc.

Welding methods have become vitally necessary (a) as an element in facilitating design, (b) as an economical manufacturing method, (c) as an aid to good service performance and (d) as a convenient means of making repairs. Examples are taken and analyzed to help the designer, shop superintendent and welding operator to a better understanding of the problems involved.*

By I. T. HOOK

Research Engineer, The American Brass Company, Waterbury, Connecticut

Connections Headers to Shell

The tube sheet or header takes a variety of forms from a thick, flat plate to a thin, closed cylinder or oval or annular vessel. In the latter type, frequently used with finned-tube radiators, the header functions as the shell or one of them.

In many of the heat exchangers, on the other hand, the header is simply a flat tube sheet while the shell encloses the bundle of tubes and is provided with removable heads which control in-flow and out-flow of the tubes. In this case the tube sheet acts as a diaphragm to separate the contents of the tubes from the medium surrounding their exterior surface.

The simplest way to accomplish this separation of interior and exterior of tubes is by clamping each of the flat tube sheets between the end of the shell and the enclosing head as is done in Figure 6[1]. This does not, however, for some purposes, seal the contents of the shell with sufficient security. There are, in the long surfaces of contact, many opportunities for leaks to develop. And the loss of even a small part of a valuable charge of freon for instance may mean the impairment of the operating cycle. Hence, a welded seal is required.

This is not an easy requirement in every case. Many times the tube sheet is a copper alloy and the shell is steel. This combination is particularly difficult both from the standpoint of the making of the welded connection and operating strains. As for the latter, the designer can take care of stresses due to pressures however large but stresses arising from differential strains caused by temperature are not so easy to avoid. The effect of pressures can be discounted by suitable thickness of metal but when the stresses arise from different coefficients of expansion of two metals increased thicknesses only aggravate the trouble.

One way to avoid this difficulty is to make the shell and tubes of materials having the same coefficient of expansion. Thus, if the tubes are of copper and the shell is of copper or Everdur, shell and tubes will elongate and contract in harmony and little stress will result.

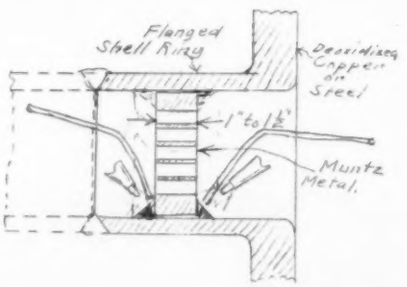

Fig. 9. Bronze weld connecting thick header to shell

As was pointed out above, the use of an expansion joint in the shell, illustrated in Figure 2, is another means of fending against such stresses. Bends in the tubes would accomplish the same purpose.

A still more effective device is to use U-tubes, sealing both ends into the same tube sheet. The tubes are then free to expand and contract entirely independent of the shell.

Connecting Thick Copper Alloy Headers to Copper Alloy or Steel Shells

In cases where a relatively thick 1" to 1½", flat copper alloy tube sheet is to be welded to a deoxidized copper, Everdur or steel shell, a careful planning of the weld is necessary. Radically different procedures may be necessary with different alloys. For instance, if the thick tube sheet is to be a beta brass such as Naval Brass, Manganese bronze or Muntz metal, it will generally be necessary to use a high degree of preheat on the tube sheet and make the weld with the oxy-ecetylene torch.

Figure 9 shows one way of accomplishing this end. Instead of preheat, two welding torches are used on opposite ends. The holes for the tubes may or may not be drilled nearly to size but they must be reamed after the welding operation is complete in order to make the surfaces clean for the hard or soft solder.

This operation is a fusion weld on the Muntz tube sheet but a braze on the deoxidized copper or steel shell. Hence, there is danger of undercutting the Muntz metal. Usually, however, there is a slight difference in the melting temperatures of the Muntz header and the bronze filler rod. Also if the filler rod or flux carry a small percent of silicon, the film developed therefrom will help hold the weld metal in place. The girth seam securing the shell to the end ring must be run after the tube sheet to end ring weld is complete.

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* Parts 1, 2 and 3 were published in our Sept., Oct. and Nov. issues.—Ed.

[1] See Metal Industry, October, 1937, page 500.

[2] See Metal Industry, September, 1937, p. 435.

Figure 10 shows the same type of connection except that the brass header is extended to make the flange and is placed against the end of the shell ring instead of inside of same. In this position, the Muntz header is subject to

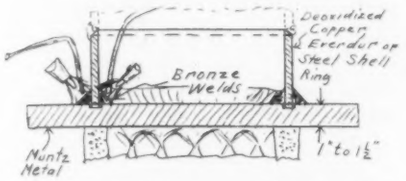


Fig. 10. Welding operation; Muntz metal header to deoxidize copper, Everdur or steel shell ring.

greater mechanical strain than when placed inside of the shell and, for this reason, it may require a slight additional thickness. Owing to the greater mass of the header in the design of Figure 10, additional preheat from a charcoal fire or a gas-air burner is suggested. The two welding torches may be smaller than would be required without preheat.

The end ring is set into a machined groove to keep it in place during the welding operation. It should also be clamped down. As in the weld of Figure 9 bronze filler rods similar to Tobin Bronze are employed. The girth, butt weld connecting the end ring with its header to the shell is made after the tube sheet has been reamed and machined.

As was explained in connection with Figure 7 (a)[3], a small hole can be drilled through the shell ring of Figure 8[4] or the header plate of Figure 10 into the space between the two fillet welds and test made with compressed air for soundness.

Fig 11. Everdur tube, sheet and head, carbon arc welded to steel shell ring.

If the tube sheet be made of Everdur instead of Muntz metal, the connection would be made as fillet welds similar to those of Figures 9 and 10 but the filler rod would be Everdur instead of Tobin bronze and the optimum welding method would be the carbon arc instead of the gas torch. Figure 11 shows this type of weld where the flat Everdur tube plate and flange is welded to a steel shell ring. The weld of Figure 11 was made with the carbon arc as illustrated in Figure 12. The weld was tested with a gas pressure of 1700 pounds per square inch and found tight.

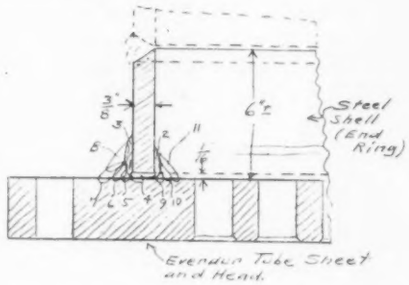


Fig. 12. Carbon arc weld with Everdur welding rod

The weld of Figure 12 was made by the carbon arc and Everdur welding rod in eleven passes as shown in the table above.

Operations in Making Weld Shown in Fig. 12.

Pass No.	Diameter Everdur Welding rod Inch	Carbon Arc Amperes	Volts (Across Arc)	Remarks
1	5/32	100	26	Coating steel only, ½" wide.
2	5/32	100	26	Coating steel only, ¾" wide.
3	5/32	100	26	Coating steel only, widens bead 1.
4	3/16	90	21	Coating steel only. Connects beads 1 and 2. Thus gas to escape between Everdur and steel surfaces would have to travel under all four passes. Bead 4 peened and machined to thickness of approximately 1/16".
5	3/32	100	22	Start of fillet weld, Everdur to Everdur. Occasional crater crack.
6	⅛	150	22	Back step welds. Peened thoroughly with air hammer.
7	3/16	170	24	Ties plate to weld. Not peened until after test.
8	¼	150	25	Ties shell to weld. Not peened until after test.
9	1/16	100	21	Small smooth bead as base for bead 10. Cracked. Peened thoroughly.
10	⅛	100	22	Crater cracks chipped out and rewelded and peened.
11	5/32	125	25	Tested at 113 pounds per square inch air pressure before peening. Chipped and rewelded leaks and peened thoroughly. No leaks at 1700 pounds per square inch hydrogen pressure. There was little distortion in the end ring or plate due to the weld.

The above illustration furnishes us with some interesting detail. Since the weld secures two dissimilar metals, it is likely that the optimum heat setting will be different for the two metals. This is true as regards Everdur and steel. It would be equally true of copper and steel or Everdur and copper. Hence the steel is first coated with Everdur. Two things are accomplished —the Everdur weld metal is brazed onto the steel under ideal, stress-free conditions insuring a strong, leak-proof bond. And secondly, the final welds are made Everdur to Everdur which simplifies the conditions under which the difficult fillet welds are made.

Since the weld of Figure 12 was an experimental one, the passes were not all made with the best conditions. Thus, beads 5 and 9 were evidently made with too high a heat. Possibly 60 amperes in a very short arc with the small rods would have resulted in solid welds free of cracks.

In commercial work, an effort would undoubtedly be made to minimize the amount of welding. But it is the writer's opinion that the number of passes should not be reduced below 9—three to coat the steel and three in each of the two fillets.

Connecting Thin Copper Alloy Tube Sheet to Copper Alloy or Steel Shell

"Thin" used in this discussion means a thickness of 3/16" to 3/8" or thereabouts. The header must be thick enough to develop the strength of the tube in a straight reamed hole, as in

[3] See Metal Industry, October, 1937, p. 501.

[4] See Metal Industry, November, 1937, p. 556.

Figure 8 (c) or (d), when the connection is sealed with a hard solder from Table 3.[5]

Generally speaking, in the designs of Figures 9 and 10, the tubes would be slipped into place and sealed in the header as a final operation after the welds described above are complete and the end assembly is attached to the shell by the girth butt welds. With the thin tube sheet, however, the tube bundle may be made up complete with the tubes sealed into the tube sheet. The bundle can then be slipped into the cylindrical shell and welded to its inner wall as illustrated in Figure 13.

It will be noted in Figure 13 that the "thin" header is flanged in order (a) to strengthen its edge, (b) to get the weld away from the hard solder seals of the tube ends and (c) to facilitate the welding operation itself.

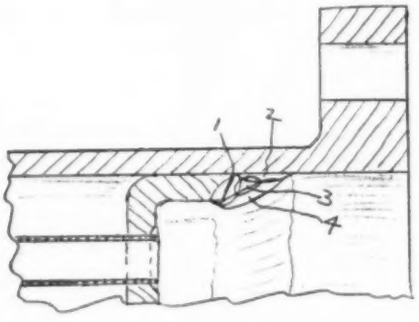


Fig. 13. *Thin tube sheet welded into cylindrical shell.*

[5]See Metal Industry, October 1937, p. 498.

Since the tube sheet is relatively thin, it is preferably made of deoxidized copper in order to cut the electropotential between header and tubes to a minimum. The shell may be deoxidized copper, Everdur or steel. In either case, the welding rod will preferably be of Everdur.

As was illustrated in connection with Figures 10 and 11, if the thin tube sheet of Figure 12 and the shell are of dissimilar metals, one or both should be coated with the weld metal before the two are tied together with the weld metal. It is probable that, with the high heat necessary to fuse the Everdur weld metal to the deoxidized copper, it would be desirable to coat the latter before the tubes are hard soldered into place.

The shell can not, of course, be coated with the Everdur weld metal until the tube bundle and header are in place.

Part 5 dealing with the manufacture of equipment from copper alloy sheets will follow in an early issue.

Recovery of Silver

In preparing silver salts for plating solutions from recovered silver, the first step is to dissolve the silver in a mixture of equal parts of nitric acid and water. From this point the procedure to be followed depends upon the quality of the silver.

Silver which is deposited on the cathode of an electrolytic stripping solution is usually contaminated by metals like copper, zinc, tin, etc., which have been dissolved together with the silver from the article being stripped. To the nitric acid solution of the silver and other metals, sodium chloride is added to precipitate the silver as the insoluble chloride. Each ounce of silver requires approximately 0.55 ounces of pure sodium chloride for complete precipitation. The silver chloride is washed thoroughly by decantation and either dried or dissolved in sodium cyanide to form a solution containing sodium silver cyanide and sodium chloride. Each ounce of silver chloride requires slightly more than 2/3 oz. of commercial sodium cyanide. Separation of the two salts is not attempted and the solution is added directly to the silver bath.

Silver is recovered from acid stripping solutions by the addition of sodium chloride, as above. This separates the silver from the other metals which have been dissolved by the strip. The silver chloride is washed and dried or dissolved in sodium cyanide.

The two most common chemical methods in use for the recovery of silver from old silver plating solutions are by means of zinc and by the addition of sodium sulfide. In the former process an excess of powdered zinc is added to the solution and stirred. The zinc dissolves and displaces an equivalent amount of silver. The precipitate is filtered and washed, after which the excess zinc is dissolved in hydrochloric acid leaving the pure silver behind. If the solution is seriously contaminated by other metals, the zinc will have a tendency to throw down these also, so that after dissolving the silver mud in the nitric acid it may be necessary to precipitate the silver with sodium chloride.

Upon the addition of a 15% solution of sodium sulfide to a heated silver solution, an insoluble curdy precipitate of brown silver sulfide is formed which can easily be separated from the rest of the solution by decantation and washing. If the silver solution contains zinc this will also be precipitated and will necessitate a separation with sodium chloride after dissolving in nitric acid.

If the silver or silver sulfide is of sufficient purity, so that separation by the silver chloride method is not necessary, it is possible to prepare a pure silver cyanide in the following way:

The silver or silver sulfide is dissolved in nitric acid, heating until no more brown fumes are evolved and cooled to room temperature. The excess nitric acid is neutralized with a solution of caustic soda. A dilute solution of sodium cyanide is now added in small quantities until all the silver is precipitated as silver cyanide. An excess of sodium cyanide must be avoided, since the precipitate will begin to redissolve. Each ounce of silver requires roughly ½ ounce of commercial sodium cyanide to form the insoluble cyanide.

The precipitate is washed thoroughly by decantation or filtering, the first portion of the filtrate being tested with sodium cyanide to see whether all the silver has been precipitated, and dried at low temperature.

To sum up, if the silver nitrate solution contains impurities, it is more economical to prepare the dry silver salt as the chloride rather than the cyanide. If the silver nitrate solution is pure however, preparation of the silver cyanide is feasible and will eliminate loading the plating solution with chlorides.

—N. Hall and G. B. Hogaboom, Jr.

Miscellanies*

Pure platinum can be drawn into wire having a diameter of only one one-hundred thousandth of an inch. Two troy ounces of platinum would in this way yield enough wire to circle the globe at the equator.

About 2,200 of the 6,000 or so standard alloys in use today contain nickel

*From White Metal News Letter, International Nickel Co.

The Polishing Department Needs More Attention!

A description of the polishing department of the National Cash Register Co., which has been carefully laid out and is under close technical control.

By E. W. COCHRAN

Foreman, Polishing-Plating Dept., National Cash Register Co., Dayton, O.

Need for Technical Control

POLISHING departments need more attention than they generally receive in manufacturing plants. To obtain the best results, the polishing equipment should be installed in a room provided with good lighting and ventilation, and should be given the same attention by the man in charge of production, as any other department in the factory. If this is not done the foreman may initiate his own policy, resulting in the lack of standardization, thereby often increasing the cost and lowering the quality of the product.

There is need for standardized practice in polishing departments as well as in the machining departments. Frequently, however, when a matter pertaining to polishing, such as the kind of wheels or abrasive to use, it is left up to the head polisher to decide. Sometimes his recommendations are correct; often they are not. The head polisher is usually a graduate from the ranks and frequently looks with suspicion on any new idea that affects his work, or may have a tendency to increase the use of automatic equipment.

There seems to be a feeling in many organizations that the polishing department is a place of manufacturing where efficiency need not be seriously regarded and where engineering has no place. In reality there are few departments where installation of improved methods and equipment, will reflect more directly on the quality and cost of the work produced than in the polishing department.

Importance of Correctly Designed Work

The best results in polishing may often depend upon the design of the piece. In fact, the proper place to approach the polishing industry with a view to improving results, is in the drafting room in the engineering department, for in designing any new article the manner and quality of finish can be greatly influenced by the contour of the part. It is often possible to eliminate small concave surfaces without affecting the appearance or the usefulness of the part, and by this means make it possible for polishing wheels to reach all surfaces to produce the desired finish. Oftentimes a small expenditure in forging, casting or punching, by making minor changes in dies or patterns, will result in large savings in finishing the article. It is not unusual in our factory even, to make changes in the original design to obtain a reduction in the cost of finishing.

National Cash Register Company Installation

The polishing department at the National Cash Register Co. is installed in a room provided with good lighting and ventilation. Our equipment is of the best for our type of work. We have a complete exhaust system to each machine.

We have one type polishing lathe used throughout the department, manufactured by the same concern.

A view of the Polishing and Buffing Department of the National Cash Register Co., Dayton, Ohio.

This reduces maintenance cost of carrying extra spindles, motors, bearings, etc., to be used in case of breakdown. Parts being common to all machines facilitate quick change, thus reducing "down time."

Close Control of Setting-Up Room

In order to obtain a high efficiency in polishing, it is very important that the correct wheels be used for each job and the correct grain size used in setting up wheels. Therefore, we keep a constant check on our wheel room to be sure it is free from draft to prevent chilling of glue and to maintain uniform room temperature for drying wheels. We hold our glue mixture in accordance with research specification as to grain set up. The glue cooker and heating unit are controlled by thermostats.

Test Runs to Determine Best Abrasive

In order to determine the correct wheels and grain size we run a tryout on the part itself.

Our set up at the present time on cabinet parts is using five wheels for bright chrome finish, starting with (120 rag) finishing on (200 color felt).

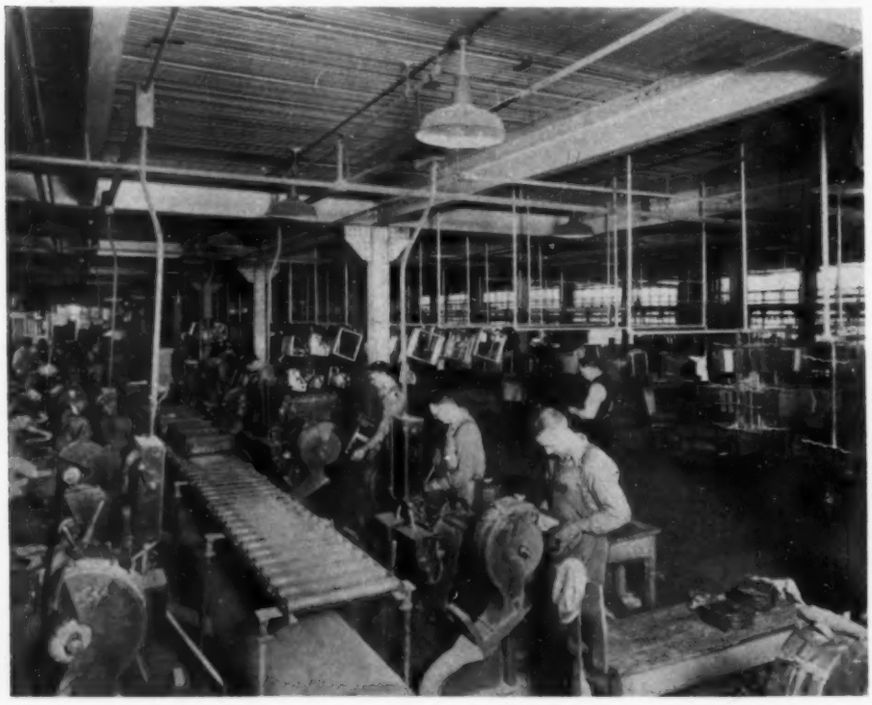
We have gone through quite an extensive tryout on abrasives, artificial and natural, with the following results. We have gone to the use of artificial abrasives for all 70-90- and 120 grain work, and on parts which require a finer finish we use natural abrasives 150-180-200 and 320 flour.

The research department is constantly on the lookout for any wheels, abrasives, compounds, greases, etc., that might improve our methods or reduce the cost of supplies.

All tryouts of wheels or compounds are put to the actual test by the polisher himself. We compare the results obtained against the wheels or compounds now being used. Tests are made as to wheel life, cushion, etc., and if a satisfactory result is shown it is O. K. for a source of supply. We will not run a research tryout on compounds, unless there is a sufficient amount to run a complete tryout for a day, for not less than four men.

Automatic Handling and Inspection

In order to maintain a high standard of finish, the polishing department is equipped with chain and belt conveyors, to eliminate wrapping and trucking of finished, polished and buffed stock. On cabinets and cabinet parts we have a one hundred percent inspection in back of polishers and buffers. The duties of these inspectors are to inspect for quality and quantity and see that work is put on conveyor correctly to carry to the next operation.



Note the orderly layout, conveyor mechanism and good light.

Copper-Lead Bearings Give Long Service

Reports of 20,000 hours and up of continuous service under extremely heavy duty conditions are becoming usual with bearings made from new special alloys of copper and lead, reports the Bohn Aluminum and Brass Corporation, Detroit, Mich. According to this authority there is a growing tendency to use these bearings for particularly heavy work where the loads on the bearings are unusually great.

Soft Metal in Car Springs

In our December issue, in the report of the Automobile Show held in Grand Central Palace, October 27-November 3rd, we noted that the Packard Motor Car Company is using a soft metal alloy in the two lower leaves of its rear spring, in order to improve the riding qualities and reduce friction.

We have been informed since that these separators are supplied in rubber, oilless bronze, 5% antimonial lead, 7½% antimonial lead and 10% antimonial lead. The distribution varies with the body type, each ride being worked out individually. One button is inserted in the depression at each end of the spring leaf.

Bound Volumes of Metal Industry for 1938

Bound volumes of METAL INDUSTRY for 1937 will be available about Feb. 1, 1938, at $3 each.

Bound Volumes for 1938 will be furnished only on order and not from stock as has been our practice in the past.

We urge those of our readers who are interested in keeping full files of METAL INDUSTRY, to send in their orders without delay.

We suggest also that subscribers file their copies as received. At the end of the year we will supply a suitable Binder at a reasonable price to those who send in their orders. Announcement of this Binder will be made again in our issues of November and December, 1938.

Tin Plating Aluminum Alloy Automobile Pistons by Immersion

Close fit demands coating to reduce breaking in time and reduce danger of scuffing. Cleaning, acid dipping and plating; temperature and solution control.

By DALE BROWN, V. SHULBERG and G. BELL
Chemical Engineers, Bohn Aluminum and Brass Corp., Detroit, Mich.

1938 Automobile Pistons Fit Closer

PISTON fits on 1938 automobiles are closer than ever before in the history of the automobile industry. In the new Autothermic piston which will be installed on a number of 1938 models piston fits are ranging from .0005 to .001 in. clearance, compared with the original clearances required in aluminum pistons which ran up as high as .006 to .008 inch.

It is now general practice to prepare the surface of the piston for its initial wear. In the case of the Autothermic piston, tin-plating is being used which reduces the breaking-in time and also eliminates danger of scuffing. The tin-plating provides an initial bearing surface instead of requiring a bearing surface to be developed due to use.

This article is an outline of the operations involved in depositing tin coatings on aluminum-alloy pistons. The illustration (p. 12) shows graphically the steps in the process and the essential specifications of each. The authors have also included in the article instructions for the chemical determinations required to control the tin bath in production. In the detailed description which follows they discuss each step separately, beginning with the first operation, the cleaning bath.

The Cleaner

The purpose of the cleaning dip is, of course, to remove grease and cutting compounds. This is accomplished by a two- or three-second dip in a hot solution of metal cleaner. The cleaner should be one which will not readily attack aluminum, i. e., one whose free alkali content is low, or which contains inhibitors.

The cleaning solution is made up by adding five or six ounces of cleaner per gallon of water. The solution should be kept at between 175 and 185 deg. F., and an automatic temperature control should be installed on the cleaning tank. If the temperature is permitted to rise too high, a blistered plate will be deposited. If the cleaning solution is allowed to become too cool, the cleaner is not effective and poor plating will result. It is not essential that the aluminum be chemically clean, that is, free from water breaks. A small water break will not cause any harm, as the tin-plating bath, being alkaline, will complete the cleaning. In fact, it would be much better to have a small water break than to leave the piston in the cleaner for too long a period of time. Leaving the pistons in the cleaner too long causes blistering and also a rough coating.

A rack, suitable for use in the cleaning solution and all of the following steps, is best made of steel with a very heavy chromium plate. The tank can be of sheet steel, heavy enough to withstand routine bumping.

Acid Dip

The second step is a cold-water rinse to remove the cleaner. This should be running water in a tank similar to the cleaning tank.

The third step is a one-second dip in a 20 per cent nitric-acid solution, to remove the last traces of cleaner. If any cleaner is left on the pistons, it would be transferred to the tin bath and tend to build up the free alkali. The effect of the free alkali in the tin bath will be discussed below. The acid solution is used at room temperature. The acid should be kept in either a stone-ware tank or a wooden tank lined with asphalt.

The fourth step is a cold rinse. This

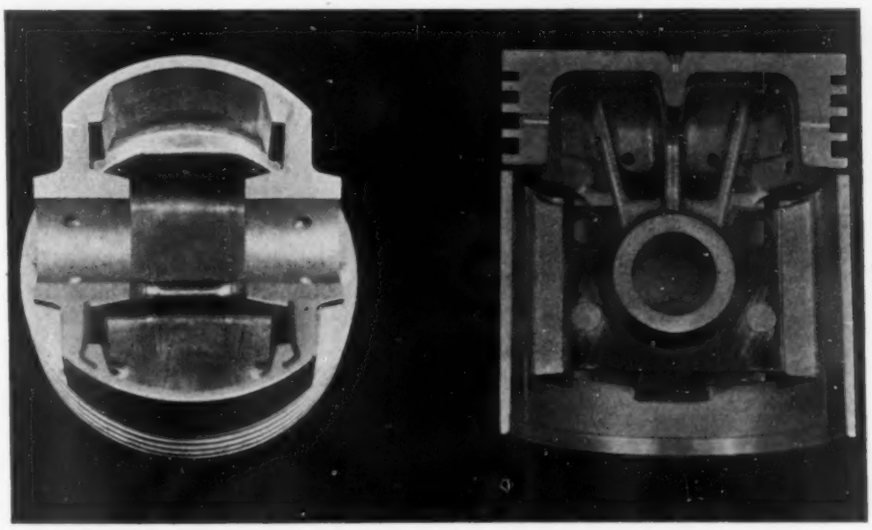


Fig. 1. *Nelson Bohnalite piston, Autothermic type, sawed to show cross-section. This is the tin plated unit used on the* 1938 *Packard, Graham and other models.*

should be running water and may be the same tank as that used to rinse after Step. No. 1.

Immersion Plating

The fifth step is the immersion plating. This is accomplished by a three-to-five minute dip in a hot solution containing 6 ounces per gallon of technical sodium stannate. The sodium stannate used should be of fresh stock and also have a low free alkali content. By free alkali is meant alkalinity present due to other factors than the carbonates and alkalinity due to the disassociation of the sodium stannate. The conditions necessary for obtaining a good tin coating are: (1) that the temperature of the bath be very carefully maintained between 175 and 180 deg. F.; (2) that the tin content be held between 0.8 and 2.15 ounces per gallon; (3) that the free alkali be less than 1.25 ounces per gallon.

If the temperature of the stannate bath is not high enough, only a small amount of tin will displace the aluminum, with the result that the coating will be very thin. Allowing the temperature to rise above the maximum will cause blisters in the coating. Most of the blisters encountered in this process will have been caused by a lack of temperature control. For this reason an automatic control on the bath is very essential. It might be well to state that blistering as mentioned in this article cannot be seen with the naked eye. A binocular microscope with a magnifying power of 30 is used, and the blisters appearing are small even then.

Other factors being normal, the tin content of the bath and the length of immersion control the thickness of the coating deposited on the pistons. Within the tin limits as previously given, a uniform thickness is deposited. As the tin content drops below the lower limit, the coating becomes thinner. In a new solution, the first few pistons will have a thicker coating. However, this is not true after the tin content has been replenished by additions of sodium stannate. Before additions are made, the bath should be analyzed for tin and free alkali. The sodium stannate should always be dissolved in water and then added slowly to the bath. The bath should be stirred vigorously while the addition is being made.

When a piston is first placed in the bath, vigorous boiling takes place, with evolution of hydrogen gas. This boiling continues for two to three minutes, and then only a few bubbles of gas are evolved. After the boiling has stopped, nearly all the tin that it is possible to deposit has been plated on the piston. Longer periods of time cause blistering and etching of the

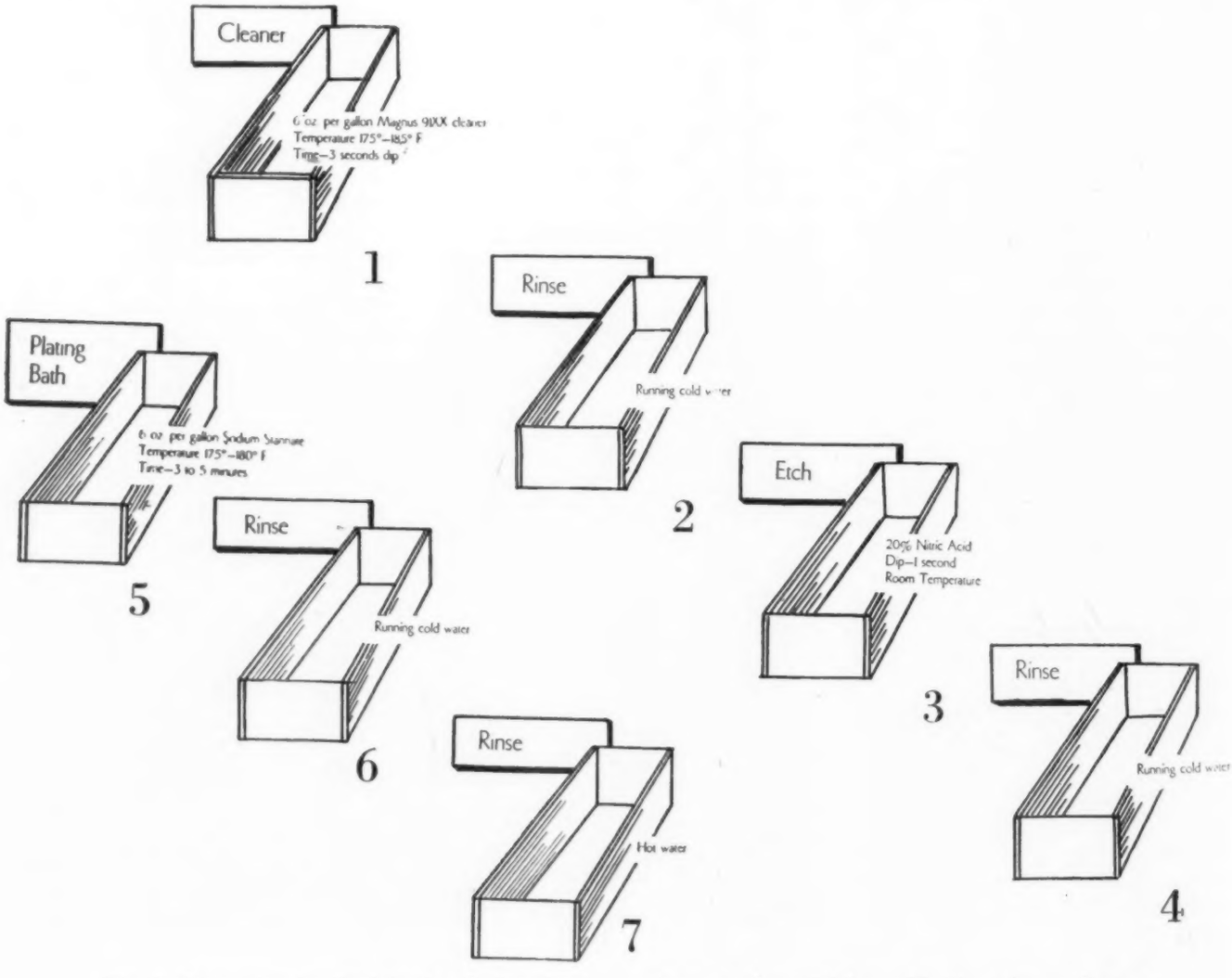


Fig. 2. Operations involved in tin plating aluminum pistons and essential specifications for each step.

coating. This is especially true when the free alkali is high.

The free alkali content in the bath is a large factor in the adherence of the tin coating. A slight excess of free alkali will cause the coating to flake off when tested by scratching with a sharp point while examining under the microscope. Excess free alkali also causes the coating to become spongy. The appearance is very nearly the same as with good adherence, and the coating must be examined with a microscope.

The free alkali increases as the bath is operated and also when additions of sodium stannate are made. Acetic acid may be used to neutralize the alkali. Several precautions must be taken when adding the acid, or the tin will be precipitated as stannic acid. They are as follows:

(1) The acetic acid used must be added in the form of a solution containing not more than 10 per cent of acid by volume.

(2) The acetic acid must be added very slowly, and the bath must be violently stirred so as to permit the stannic acid that is being formed to redissolve.

(3) The acid should be added when the tin content is near the lower limit.

When the tin content is high, the stannic acid is not as apt to redissolve, and the tin would be lost. This means that the acid should always be added before the sodium stannate. Sufficient acid should be added to neutralize nearly all the free alkali, or more will have to be added after the bath has been operated a short time. If the sodium stannate is not first dissolved and then slowly added, the acid which has just been added tends to react with the sodium stannate and precipitate the tin.

A sludge will collect in the bottom of the tank, composed of stannic acid and sodium-aluminum compounds. This may be removed periodically, but does not affect the operation of the bath.

The sixth step is a rinse in running cold water, followed by a rinse in hot water to dry the pistons, after which they are ready for use.

These steps, if followed as outlined above, will produce a coating of tin about 0.0002 in. thick on aluminum piston alloys. The coating is of a bright gray characteristic tin color, and a good coating should have considerable metallic lustre. Dark coatings are poor coatings and indicate unusually high alkalinity or low tin in the bath.

Methods of Bath Control

We have as yet no control test to apply to the tin coating itself, other than that of scratching the tin coat with a sharp needle point under the binocular microscope. When this test is applied, poor coatings peel off in flakes, while brighter, better, unblistered coatings are adherent.

Methods for the Control of Solution

Free Alkali—Into a 250 cc. Erlenmeyer flask, carefully measure 10 cc. of clear and cold plating solution from a pipette or burette. To this add 50 cc. of barium chloride solution. This solution is made by dissolving 100 grams of barium chloride in 1000 cc. of water. The purpose of the barium chloride is to precipitate all carbonate as barium carbonate and the sodium stannate as barium stannate. The flask is then tightly stoppered, shaken, and allowed to stand for five to ten minutes. After standing the required time, add about five drops of phenolphthalein indicator solution, made by dissolving half a gram of phenolphthalein in alcohol and diluting with water to 100 cc. Then add one-tenth normal hydrochloric acid from a burette until the solution just turns white and shows no pink coloration. On standing a few minutes, the solution begins to turn pink again, but this change can be disregarded. It is due to the dissociation of barium stannate and does not enter into the general scheme of analysis. The amount of free alkali is determined by the equation: No. of cc. acid used X 0.40 X 0.134 = ounces of free alkali per gallon. Some methods of analysis involve filtering the precipitate of barium carbonate and barium stannate before titrating with hydrochloric acid. This method has been abandoned in this laboratory because there is no method for knowing when the washing of the precipitate is complete. Due to the slight solubility of barium stannate, a test for the presence of alkali is confirmed even after using several liters of wash water. The washings will continue to show pink to phenolphthalein until all barium stannate has been dissolved.

Tin Content—For the standardization of the K IO_3 solution the following apparatus is required: A 500 cc. Erlenmeyer flask with a one-hole stopper carrying a glass tube bent so that the outer end may be immersed

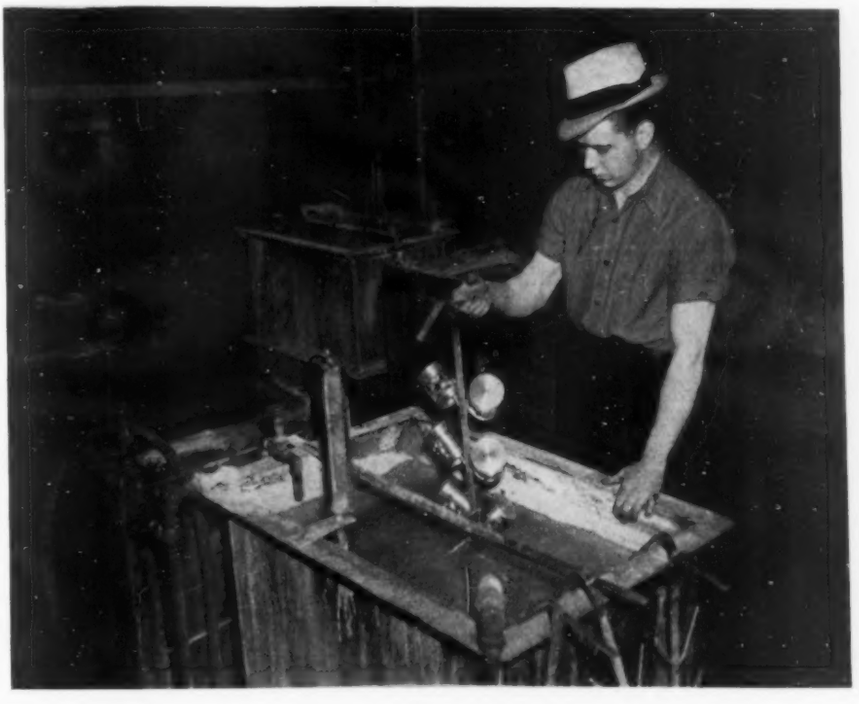


Fig. 3. Tin plating Graham pistons of the Bohn Autothermic type at the Graham-Paige Motors Corp., Detroit, Mich.

in a solution of sodium bicarbonate. The solutions required are as follows: Hydrochloric acid of 1.19 sp. gr.; a saturated solution of sodium bicarbonate in distilled water; a starch solution prepared by first making a paste of 1 gram of soluble starch and pouring it into 150 cc. of hot water, the solution being made as required; a potassium iodide solution made by dissolving 1.43 grams of K IO_3, 10.00 grams of KI and 1.00 gram of K O H in distilled water and diluting to make 1 liter.

Weigh out 0.50 gram of solder having a known tin content and place in a 500 cc. Erlenmeyer flask. Add 20 cc. concentrated sulfuric acid and set on hot plate. Boil until there are no particles of metal showing, and allow to cool.

Now add about 150 cc. of water, 60 cc. of concentrated hydrochloric acid, and 2 grams of powdered antimony metal. Insert the stopper and delivery tube in the flask and boil 25 minutes. Before removing from the hot plate, and while the solution is boiling freely, immerse the outer end of the delivery tube in a 400 cc. beaker which is about half full of sodium bicarbonate solution. Place both in running water and allow to cool; as the flask cools, sodium bicarbonate will be drawn in. This provides an atmosphere of carbon dioxide and prevents the oxidation of the tin. After it is cool, remove the delivery tube and filter through an asbestos pad with the use of a suction pump. This is done to make a clearer end point than is possible in the presence of powdered antimony. While some chemists may not approve of filtering, good results can be obtained if filtered by suction. However, speed is essential at this point. Immediately add to the flask 3 cc. of starch solution and titrate with K IO_3 solution until a permanent faint blue color is present. The number of grams of tin used divided by the number of cc. of K IO_3 solution gives the factor. By carefully weighing the amount of K IO_3 recommended here, the factor should be 1 cc. of potassium iodate solution equal to 0.0025 gram of tin.

Tin in the Plating Bath—By means of a pipette or burette, transfer 5 cc. of the clear cold plating solution into a 500 cc. Erlenmeyer flask. Dilute to 150 cc. with water and then add 60 cc. of concentrated hydrochloric acid and two or three grams of powdered antimony metal. Insert the stopper with the delivery tube attachment and set on a hot plate. Boil fifteen minutes, and just before removing, insert the outer end of the delivery tube into the sodium bicarbonate solution and then place both in running water. After the flask is cool, remove the delivery tube and filter through an asbestos pad, using suction as before. Immediately add 3 cc. of starch solution and titrate with the K IO_3 solution until a faint blue color persists. If the tin content is low, as in an exhausted bath, add ½ gram of potassium iodide before titrating. This provides enough iodine to insure a blue color when the end point is reached. The amount of tin is determined as follows:

$$\frac{\text{No. cc. K } IO_3 \text{ used} \times \text{factor} \times 1000}{\text{Volume of solution (5 cc.)}} \times 0.134 = \text{oz. of tin per gal.}$$

For example, a new bath took 30.3 cc K IO_3, and the factor is 1 cc. = .0025 gm. tin.

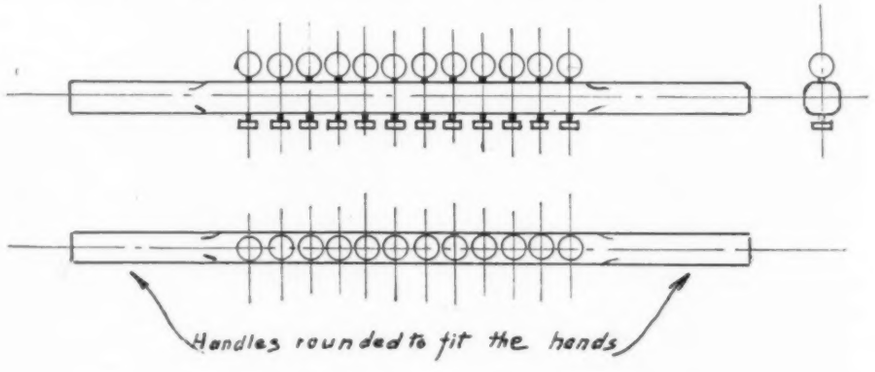
$$\frac{30.3 \times 0.0025 \times 1000}{5} \times 0.134 = 2.03 \text{ oz. of tin per gal.}$$

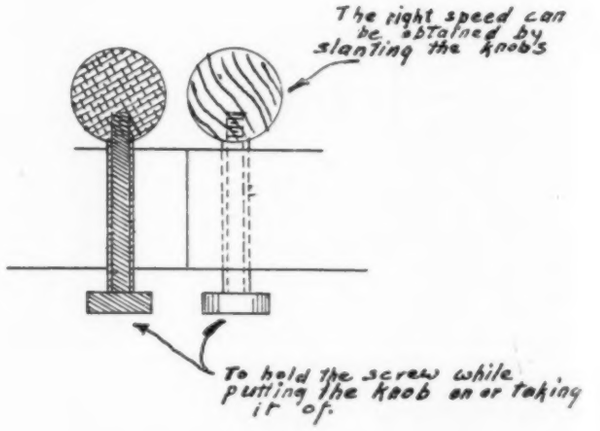
Polishing Aluminum Drawer Pulls

By **PAUL LINDBERG,**
Metal Polisher, New York

I read with interest the Shop Problem on page 625 of your December issue on Satin Finish on Aluminum. The answer by your expert, G. B. H., Jr., advised automatic polishing if possible or setting up a small jig.

I am a metal polisher with many years experience and I believe that a simple holder as illustrated in the drawing would answer the problem as well as any automatic machine. A boy could put the drawer pulls on and take off the holder while the polisher does the work.





A jig for polishing drawer pulls in quantity

A Study of the Rochelle Salt-Copper Plating Bath

Part III. Further data on anode behavior with special reference to insoluble anodes.*

By A. KENNETH GRAHAM[1] and HAROLD J. READ[2]

IN PART II of this paper the limiting anode current density beyond which copper anodes polarize excessively was determined over a range of pH values from 10.7 to 13.3 for a variety of Rochelle salt-copper baths at a temperature of 131°F. These results are further summarized in Table III. It will be noted that the limiting anode current density for copper is below 30 a./s.f. for practically all cases except in the presence of high concentration of sodium carbonate. Bath No. 1 at a pH of 13.3 does not polarize the anode at 76 a./s.f., but it has been pointed out that the efficiency in this case is too low to be considered practical.

Insoluble Anodes

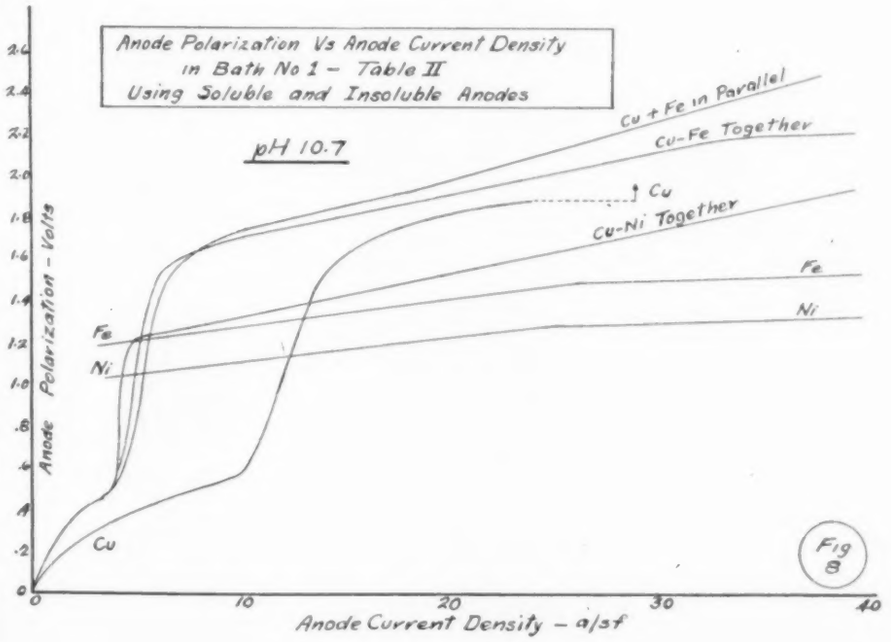
Insoluble anodes are commonly used as part of the anode area in plating from copper cyanide baths. The behavior of iron and nickel anodes when used alone was therefore investigated. Combinations of copper and iron connected in parallel and of copper and iron tied together in intimate contact were also studied. Because of the possibility of iron contaminating the plating bath under certain conditions, a combination of nickel and copper tied together in intimate contact was studied in addition.

The variation of the anode polarization with current density, using the several anode materials and combinations mentioned above, was first determined in a Rochelle salt-copper bath of composition No. 1 (Table II). Referring to Fig. 8, it may be seen that at a pH of 10.7 the polarization for insoluble anodes of iron and nickel, respectively, is a fairly constant value up to 40 a./s.f., the curves being practically straight lines. Copper, when used alone as an anode, polarizes excessively at a current density above 24 a./s.f. However, when connected either in parallel, or when tied together, the copper-iron or the copper-nickel combinations do not polarize at current densities well in excess of the limiting value for copper alone.

Similar results were obtained at a pH of 12.8 as shown in Fig. 9 (p. 17) although the position of the several polarization curves is altered somewhat. Higher current densities than those recorded in the figures discussed

Table II. Bath Compositions Studied

Bath No.	CuCn oz./gal.	Free NaCn oz./gal.	Rochelle salts oz./gal.	Soda ash oz./gal.	Variable
1	3.5	0.75	4	2	Reference bath
2	3.5	2.0	4	2	Higher free cyanide
3	3.5	0.75	4	9	Higher carbonate
4	4.0	1.6		2	No tartrate
5	5.5	0.75	4	2	Higher metal
6	7.0	0.75	4	2	Still higher metal
7	3.5	0.75	8	2	Higher tartrate
8	3.5	0.75	8	9	High tartrate & carbonate
9	7.0	0.75	8	2	High metal & tartrate
10	3.5	0.75	4	0	No carbonate
11	3.5	0.75	8	0	High tartrate, no carbonate



* Parts 1 and 2 were published in Metal Industry for November and December, 1937.

[1] Consultant, A. Kenneth Graham and Associates, Jenkintown, Penna.

[2] Present address: Department of Chemistry and Chemical Engineering, John Harrison Laboratory, University of Pennsylvania, Philadelphia, Penna.

above were actually employed in attempting to determine the limiting current density for these anodes, and the complete data, including the anode polarization, are recorded in Table IV. It is safe to say that anode current densities considerably in excess of 50 a./s.f. may be used in copper plating from a bath similar to composition No. 1 without excessive polarization, provided a portion of the anode area consists of iron or nickel. The percentage of insoluble area is not critical, and the distance of the soluble anode from the insoluble anode when not in intimate contact does not seem to be a factor. An insoluble iron anode area equal to 5% of the total area behaved in the same manner as an anode area consisting of equal surfaces of iron and copper.

Variation of the bath composition does not seem to alter the behavior of the iron-copper combination anode. The results recorded in Table III show limiting anode current densities in excess of 96 a./s.f. within the pH range studied (10.7-12.8) regardless of bath composition. The manner in which the soluble anode area is depolarized by the presence of the insoluble anode area is clearly illustrated in Table V, and in Fig. 10 p. 18. The data are recorded for an iron-copper anode of equal area, connected in parallel, in Bath No. 1, which was operated at pH values of 10.7 and 12.8 and a temperature of 131°F. The dotted lines show the percentage of the current carried by the iron and copper as the average current density on the total anode area is increased. The solid lines for both copper and iron represent the variation of the individual current densities for each of these metals as the total average current density is increased.

It may be seen that up to a current density of about 6 a./s.f. the copper carries all the current and the iron carries none. As the current density is further increased, the copper carries less current and the iron carries more. At about the current density corresponding to the limiting value for a copper anode alone in a bath of the composition in question, the copper and iron each carry about 50 per cent of the total current. As the current density is increased beyond this value, the copper carries proportionately less. Actually, the current density on the copper area remains substantially constant after reaching

Table III. Limiting Anode Current Densities and Corresponding Polarization and Bath Voltage Values

Temperature 55°C (131°F)

Bath No.	Bath[1] Variable	pH	Copper Anode[2] C.D. a./s.f.	Copper Polarization[3] Volts	Copper Bath Voltage Volts	Iron-Copper Together Anode[2] C.D. a./s.f.	Iron-Copper Together Polarization[3] Iron Volts	Iron-Copper Together Polarization[3] Copper Volts	Iron-Copper Together Bath Voltage Volts
1		13.3	>78<96	1.85	3.2	..	..	..	..
1		12.8	>17<29	1.40	..	>47	2.3	2.6	4.0
1		12.3	>26<29	2.05	..	..	..	..	..
1		11.7	>26<29	2.25	..	..	..	..	..
1		10.7	>24<28	1.85	2.7	>96	2.4	2.7	4.8
2	Free	12.8	>24<27	1.45	1.9	>96	2.35	2.7	4.7
2	Cyanide	11.4	>29<32	2.15	2.9	..	..	..	..
2	2 oz./gal.	10.6	>24<28	2.0	2.7	>96	2.35	2.52	4.8
3	Carbonate	12.8	>72	1.9	3.2	>96	2.10	1.92	4.2
3	9 oz./gal.	11.8	>34	1.75	2.7	>96	2.05	1.86	4.0
3		10.6	>82	1.8	3.9	>100	2.11	1.82	4.0
4	No tar-	12.8	>15<24	3.85	4.6	>96	2.35	2.60	5.1
4	trate	10.7	>19<22	2.1	2.7	>96	2.35	2.70	5.1
5	CuCn	12.8	>19	0.86	1.4	>96	2.32	2.61	5.1
5	5.5 oz./gal.	10.7	>24	1.85	2.2	>100	2.10	2.13	4.8
6	CuCn	12.8	>19<24	0.40	1.0	>96	2.03	2.15	4.5
6	7.0 oz./gal.	10.7	>31<26	1.80	2.6	>99	2.05	2.25	4.4

Note 1: Bath No. 1 contains 3.5 oz./gal. CuCN
4.6 oz./gal. NaCN
2.0 oz./gal. Na_2CO_3
4.0 oz./gal. Rochelle salt

Note 2: >78<96 means that the anode polarized excessively at a current density greater than 78, but less than 96 a./s.f.

>34 means that 34 a./s.f. was the highest current density used, but polarization of the anode did not occur.

Note 3: Polarization values at C.D. readings indicated.

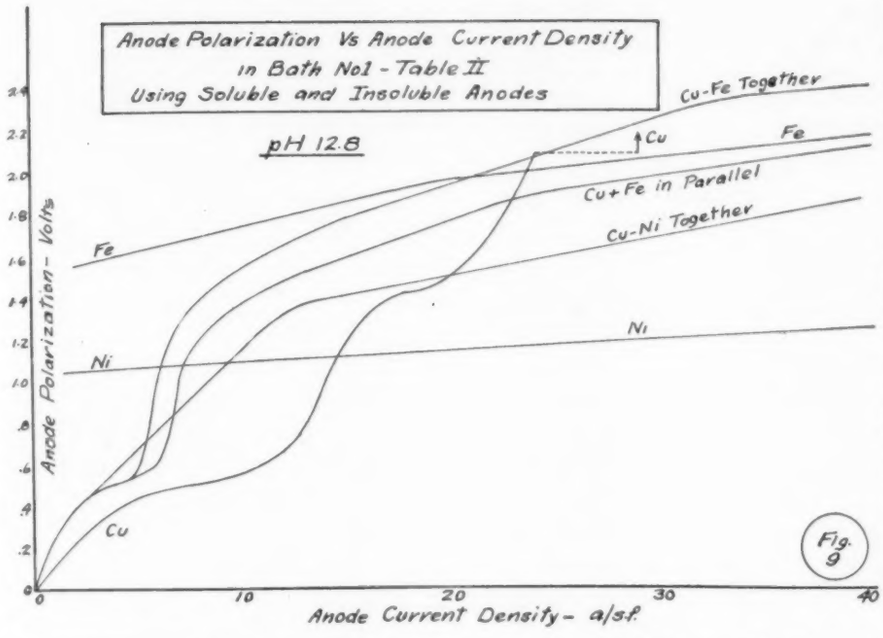
Table IV. Limiting Values of Current Density for Various Anode Materials in the Rochelle Salt-Copper Bath No. 1.

Temperature 55°C (131°F)

Anode Material	pH	Anode C.D. a./s.f.	Polarization Fe or Ni Volts	Polarization Cu Volts	Bath Voltage Volts
Copper (Cu)	12.8	>17<29	..	1.4	..
Iron (Fe)	12.8	>96	2.4	..	..
Fe-Cu Together	12.8	>47	2.3	2.6	4.0
Fe + Cu Parallel	12.8	>47	2.35	2.45	3.1
Nickel (Ni)	12.8	>96	1.3	..	3.3
Ni-Cu Together	12.8	>96	1.6	..	3.3
Copper (Cu)	10.7	>24<28	..	1.85	2.7
Iron (Fe)	10.7	>96	1.8	..	..
Fe-Cu Together	10.7	>96	2.4	2.7	4.8
Fe + Cu Parallel	10.7	>84	2.4	3.0	..
Nickel (Ni)	10.7	>96	1.65	..	3.8
Ni-Cu Together	10.7	>71<96	1.75	2.25	3.9

Table V. Current Densities and Current Distribution Using Anodes of Iron and Copper of Equal Area

Total Anode Current Density a./s.f.	Current Distribution Iron %	Current Distribution Copper %	Individual Current Densities Iron a./s.f.	Individual Current Densities Copper a./s.f.
	Bath No. 1—pH 12.8—131°F			
3.6	0	100	0	3.6
6.0	0	100	0	6.0
9.6	12.5	87.5	2.4	16.8
15.6	32.5	67.5	10.1	21.1
21.6	50.0	50.0	21.6	21.6
31.2	65.4	34.6	40.8	21.6
43.2	78.9	21.1	68.1	18.2
	Bath No. 1—pH 10.7—131°F			
3.6	0	100	0	3.6
6.0	0	100	0	6.0
9.6	25.0	75.0	4.8	14.4
16.8	47.2	52.8	15.8	17.8
26.4	54.5	45.5	28.8	24.0
37.2	74.2	25.8	51.5	20.5
50.2	76.2	23.8	76.8	24.0
84.0	81.4	18.6	137.0	31.2



the limiting current density value for copper when used alone. It should further be noted that this behavior is the same at either pH (10.7 or 12.8).

One reason for investigating insoluble anode materials was to determine to what extent they may be attacked. Furthermore, by noting any loss in weight when iron and copper were either tied together or connected in parallel, it was hoped that a difference in the amount of attack might be established. If such were the case, it would be possible to explain more readily whether iron contaminating a Rochelle salt-copper bath came from an iron tank or from the iron containers frequently in contact with ball copper anodes. The loss in weight during the polarization runs with insoluble anodes was therefore observed and the results are recorded in Table VI.

Little or no attack on the iron anodes was observed at pH values above 10.7 except in carbonate-free baths. The results below 10.7 were somewhat varied. In some cases the iron anode was badly attacked. The Rochelle salt-copper bath containing no carbonate when operated at the lower pH values frequently fell to a much lower value during the run. Under these conditions the anode was always badly attacked. It is safe to say, therefore, that operating the Rochelle salt type of bath with or without carbonate at too low a pH is the most likely cause of attack of both anode containers and iron tanks. Iron is also attacked at pH values above 10.7 in the absence of carbonates. Nickel is attacked more than iron.

The temperature employed in the work reported above was kept constant at 131°F. This temperature was chosen because of the ease with which it could be maintained and with which polarization measurements could be made. It is realized that higher temperatures are commonly used in operating this type of bath commercially, and while an increase in temperature is known to markedly alter the conditions at the anode, it is believed that the conclusions regarding the insoluble anode will still hold at higher temperatures. The soluble copper anode when used alone, on the other hand, can probably be operated at somewhat higher current densities than recorded in this paper if higher temperatures are used.

The Effect of Iron

If a Rochelle salt-copper bath becomes contaminated with iron, it affects the analytical control of the bath. In determining the copper, iron is precipitated when the sample is made ammoniacal. The addition of acetic acid in the prescribed amount may or may not redissolve all the iron. The solution, in any event, is colored in a way that makes it difficult to observe the end point of the titration of the iodine with standard thio-sulphate solution in the presence of starch. An addition of enough sodium fluoride to remove the iron in the form of a complex salt has been recommended. This is added after the acetic acid and eliminates the difficulty in determining the endpoint of the copper titration.

No bad effects due to iron, in so far as the character of deposits or the plant operation of the bath are concerned, have been observed.

Summary

Using a variety of Rochelle salt-copper bath compositions—

1. Copper anodes have been found to polarize excessively at comparatively low current densities (20 to 30 a./s.f.).

Table VI. Loss in Weight of Insoluble Anodes in Rochelle-Salt Copper Baths at Various Values of pH.

Bath No.	pH	Anode Material[1]	Loss in Weight[2] gms./sq. ft.	Na_2CO_3 oz./gal.
1	12.8	Fe and Cu in parallel	0.14(Fe)	2.0
1	10.7	Fe and Cu in parallel	0.29(Fe)	2.0
1	12.8	Fe	0.00	2.0
1	10.7	Fe	0.77	2.0
1	12.8	Ni and Cu tied together	1.29(Ni)	2.0
1	10.7	Ni and Cu tied together	5.52(Ni)	2.0
1	12.4	Ni	0.00	2.0
1	10.7	Ni	0.24	2.0
2	12.8	Fe	0.00	2.0
2	10.6	Fe	0.29	2.0
3	12.7	Fe	0.00	9.0
3	11.8	Fe	0.05	9.0
3	10.6	Fe	0.10	9.0
10	12.8	Fe and Cu tied together	0.58(Fe)	0.0
10	9.8	Fe and Cu tied together	11.05(Fe)	0.0
11	12.7	Fe and Cu tied together	Excess(Fe)	0.0
11	11.4	Fe and Cu tied together	11.05(Fe)	0.0

[1]Fe—Iron, Cu—Copper, Ni—Nickel.
[2]Variable current densities for 1 to 2 hours.

2. Insoluble anodes of iron and nickel do not polarize excessively even at high current densities.

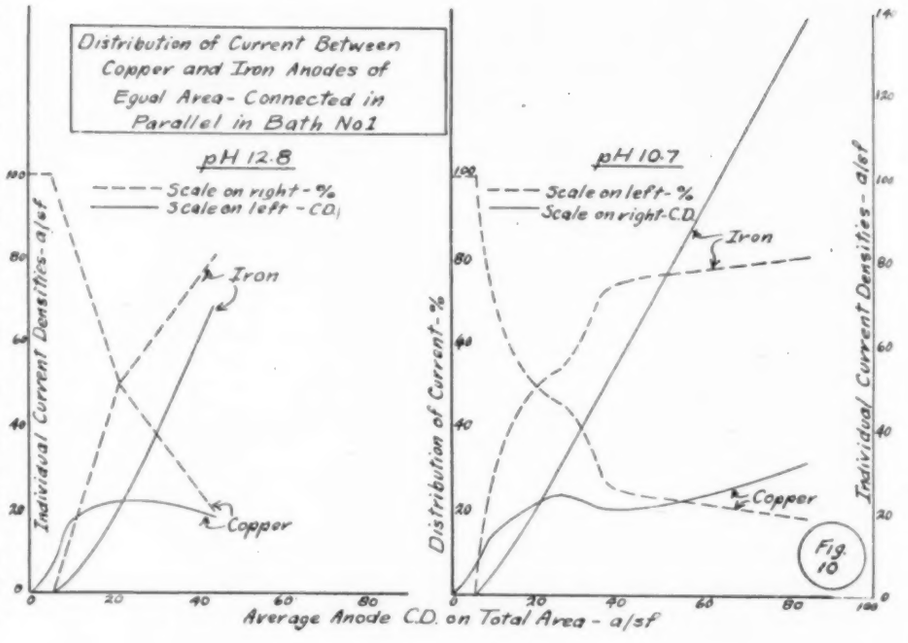
3. Insoluble anodes used in conjunction with soluble copper anodes depolarize the latter and permit higher anode current densities.

4. Insoluble iron anodes have been found to suffer attack when used at a pH value of about 10.7 or less, especially in the absence of carbonates.

5. An iron plating tank would also be attacked if in electrical circuit while operating a bath at too low a pH.

6. Iron in the bath affects the analytical control, necessitating slight modifications of the methods, but does not apparently affect the operation of the bath or the character of deposits.

In Part IV. which is to follow, the effect of the bath composition and of the operating conditions on the current efficiencies will be discussed.


Distribution of Current Between Copper and Iron Anodes of Equal Area - Connected in Parallel in Bath No 1
pH 12.8
Scale on right - %
Scale on left - CD
Iron
Copper
Individual Current Densities - a/sf
pH 10.7
Scale on left - %
Scale on right - C.D.
Iron
Copper
Distribution of Current - %
Individual Current Densities - a/sf
Average Anode C.D. on Total Area - a/sf
Fig. 10

A Calendar of Events of Importance of the Metal Products Manufacturing Industries in 1937

January

Copper rises to 13c per pound. All metal strong.

February

Institute of Metals Division Annual Meeting in New York, February 17-18.

Copper rises to 16c per pound. All metals strong.

March

Conference on Electroplating Research Program of the National Bureau of Standards, in Chicago, March 2nd.

International Electrodeposition Conference held in London, March 3-5.

Copper rises to 16.25. All metals strong. Cadmium sells for $1.20 a pound. Business Active.

April

Republic Steel Corporation opens huge electrogalvanizing unit for coating round wire.

Copper drops from 17c to 14c.

May

United Chromium, Inc. files suit in Pennsylvania against Proctor & Schwartz, Inc., in U. S. Patent No. 1,581,188 (Fink patent).

June

Twenty-fifth Annual (Silver Jubilee) Meeting of the American Electro-Platers' Society in New York, June 14-17.

Business shows evidence of declining. Most metal prices unchanged but unsteady. Cadmium rises to $1.60 per pound.

July

American Society for Testing Materials holds 40th Annual Meeting in New York, June 28-July 2nd.

Metal prices firmer. Business activity slightly better. Labor difficulties decreasing.

August

Metal market variable; some metals firm, others unsteady. Industrial operations recede slightly.

September

Metal prices drop sharply in sympathy with decline of security prices and growing awareness of recession in industry. Copper sells at 12.50.

October

National Metal Congress and Exposition held in Atlantic City, N. J., October 18-23.

Conference on exposure tests and research program of the National Bureau of Standards in Washington, D. C., October 6th.

Copper price reacts further to 11.75. Business recession clearly evident.

November

National Automobile Show held in New York, October 27-Nov. 3rd.

Metal prices again slip; copper at 10.75.

December

Industrial activity declines, metal prices decline further, (copper to 10.125) but rate of decline is decreasing. Sentiment begins to be hopeful for increasing business early in 1938.

A Fungus in Acid Copper Plating Baths

The growth of "jelly fish" which prevent the deposition of an adherent plate.

By NANDOR PORGES

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THE occurrence of fungi in copper plating baths with their high salt and acid content has not been reported in literature, as far as is known to the author. Such a bath had been giving difficulty, in that upon burnishing the plated object, flecks of plate would be rubbed off, thus leaving a mottled appearance. Upon close examination of the liquor, there was found a profusion of small particles that had the appearance of jelly fish. Evidently, these particles moved with the current, were fixed on the metal, and were in turn covered with copper. Upon removal from the bath, these dried and were rubbed off by the burnisher, thus leaving the bare spots. These "jelly-fish" ranged in size up to one-half inch in diameter. Their appearance and size variation led to the supposition that this was a growth of some nature.

Small portions of the liquid, as well as some of the growths, were mixed with various nutrient agars conducive to the growth of various microorganisms, and plated in Petri dishes. In every case, a pure culture of fungus was obtained. Studies were made to ascertain its ability to grow in the presence and absence of copper and acid. Fifty cc. portions of Czapek's solution[1] were distributed in 200 cc. Erlenmeyer flasks and sterilized. These were divided into three series: (a) copper sulfate added from zero to 12 gm. per flask; (b) copper sulfate varied as in the first series, but in addition, each flask had 0.5 cc. concentrated sulfuric acid added; (c) no copper was added, but the acid added ranged from 0.25 cc. to 1.15 cc. per flask. These were inoculated and kept in a cabinet at room temperature for five weeks. Those containing copper showed a very slight growth, while the flasks containing acid and no copper showed a profuse development of fungus. The dried weights of such mats were approximately 0.5 gm. as compared to the mats grown in the absence of acid which weighed about 0.25 gm. Wehmer[2] reported that he obtained a Citromyces from a 0.5% sulfuric acid solution, while the organism reported in this paper grows in solutions containing 6.8% acid, as will be noted.

As the use of tap water for the baths is a common practice, a series of tests were made using this source of water. Czapek's solution contains 3% sugar, hence water was used in the presence and absence of sugar. Erlenmeyer flasks containing 50 cc. portions of the liquid were sterilized, treated as indicated and inoculated. After seven months incubation at room temperature each flask was examined and the results are given in Table I.

As can be noted, the tap water appeared to counteract the toxic affect of the acid and copper, and induced the typical medusa or jelly-fish like colonies that were observed in the original bath liquor. These growths occurred in the presence of the carbohydrate and not in its absence. In no case did the Czapek solution give this type of development, and neither were the growths as heavy as that obtained in tap water if acid and copper were present in both solutions.

The presence of fungi in various chemical reagents has been noted for some time and the subject is ably reviewed by Lockwood[3]. A fungus, Penicillium lilacinum, had been isolated from nickel electrotyping baths[4], and another Penicillium were obtained from a 9.5% copper sulfate solution that had been used to treat seed[5]. A 10% solution of copper ammonium citrate has been found nontoxic to another fungus[6]. Recently there has been reported the isolation

[1] Fred, E. B., and Waksman, S. A. 1928 Laboratory Manual of General Microbiology. McGraw Hill, New York.

[2] Wehmer, C. 1913 Uber Citroensaurebildung aus Glycerin durck Pilze. Chem. Ztg. 37:37-39.

[3] Lockwood, L. B. 1936 Fungi From Laboratory Reagents. Mycologia 28:10-12.

[4] Thom, C. 1930 The *Penicillia*. Baltimore.

[5] Trabut, L. 1895 Sur un *Penicillium* vegetant dans des solutions concentrees du sulfate de cuivre. Bull. Soc. Bot. Fr. 42:33-34.

[6] Villedieu, G. M. and Mme. 1920 De la non-toxicite du cuivre pour les moisissures en general et pour le mildiou en particulier. Compt. Rend 171:737-739

Table I. The Growth of a Fungus (unknown species) in Copper Sulfate and Sulfuric Acid Solutions

Liquid	Sugar Content, %	Sulfuric Acid Content, %	Copper Sulfate Content, %	Type of Growth
Czapek	3	0	0	very heavy
Czapek	3	6.8	0	slight
Czapek	3	6.8	10	very slight
Czapek	3	6.8	21	very slight
Czapek	3	6.8	30 (in excess)	very slight
Tap water	0	0	0	slight
Tap water	0	6.8	0	fair
Tap water	0	6.8	21	none
Tap water	3	0	0	fair
Tap water	3	6.8	0	jelly-fish
Tap water	3	6.8	10	jelly-fish
Tap water	3	6.8	21	small jelly-fish
Tap water	3	6.8	30	small jelly-fish

of a new Penicillium[7] from Fehling's solution, that has the ability to grow in solutions having a concentration of copper sulfate up to 20%. As a source of nitrogen, it practically requires ammonium salts of organic acids.

The organism reported in this paper is not a Penicillium or Aspergillus and is being studied for its identification.

Summary

1. A fungus has been found growing in a copper plating bath. Metals obtained from this bath, upon burnishing, had a mottled appearance.

2. The fungus grows and produces medusa or jelly-fish like colonies throughout a solution containing copper sulfate to saturation and 6.8% sulfuric acid.

3. The jelly-fish like development is favored by tap water containing sugar rather than by nutrient solution.

4. The identity of the fungus has not been ascertained, but further study is being made.

The author is indebted to Dr. J. A. Anderson for supplying the mother liquor.

[7] Bedford, C. L. 1936 Morphological and physiological studies upon *Penicillium* sp. tolerant to saturated copper sulfate. Centr. Bakt. Parasitenk II: 94:102-112.

Exposition of Chemical Industries

THE 16th Annual Exposition of Chemical Industries was held at the Grand Central Palace, December 6-11, 1937. METAL INDUSTRY occupied Booth No. 506.

Although in the past this industry has not been unusually prominent as a factor of interest to the metal products manufacturing and metal finishing industries, within the last few years it has been noteworthy that more and more interest among the chemical manufacturers has been aroused in the need for and availability of materials which will withstand the action of their products; in other words, metals with high resistance to the corrosion of a wide variety of chemicals which includes not only base metals but semi-precious, precious and rare metals as well. As a matter of fact one of the most prominent features of this exhibit was the profusion of metals and alloys on display for use in the chemical manufacturing plant.

Another feature was the steadily growing awareness of the importance of instruments—indicating, recording and controlling — for temperature, humidity, pressure, flow, liquid level, etc. Of course, non-metallic materials such as stoneware also held a prominent place as they have always done.

Metal finishes were numerous, their primary function in most instances being decoration, although there were some outstanding exceptions to this rule. Nickel silver, rhodium and other metals were used in electroplated form for protection, reflectivity, etc.

One of the unusual features was an exhibit of rectifiers, a new type of equipment for producing low voltage direct current from alternating current, displayed by the Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. The rectifiers shown were assembled by the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies incorporating Westinghouse units. These rectifiers (described in METAL INDUSTRY for April, 1937, page 183) have the advantages of (1) freedom from moving parts; (2) low installation cost; (3) high overall efficiency and high power factor.

To manufacturers interested in metal products and finishes the Exposition fell into several divisions, described in more detail below.

Chemicals and Chemical Products

Silicates, particularly those of sodium, were well represented, one exhibitor showing thirty-three different kinds. Attention was called to the applications of silicates in many industries including metal products manufacturing.

Metals and Alloys

The role of metals and alloys in chemical engineering construction was demonstrated by comprehensive exhibits of corrosion resistant alloys and metals including, aluminum, brass and bronze. Displays of gold, silver, platinum and rhodium showed the newest application of these metals for both laboratory and plant. These displays included rhodium-platinum alloys, silver-platinum bimetallic sheets, platinum-iridium electrical contacts and fine silver inlay-overlay on steel, bronze, copper and other base metals. Special applications of lead and its alloys for corrosion resistance were exhibited, including antimonial sheet lead, tellurium sheet lead and piping. Other metal displays included babbitt metals, casting metals, type metals, solder, pewter and block tin in sheets, impression lead, gasket metal and discs for making collapsible tubes. Nickel plating was shown in interesting applications, varying thicknesses, etc., the most striking examples being fine screen manufactured entirely by electrodeposition.

Machinery

Filtering machinery was a prominent feature of the displays as were also centrifugals. Bronze and aluminum were among the materials chosen for basket construction.

Tanks and pipe lines featured rubber and molded phenolic resin as material for linings and full construction.

Instruments and Laboratory Equipment

Twenty-eight exhibitors showed instruments of precision, for indicating, recording and controlling the physical factors of temperature, pressure, humidity, liquid level, acidity, alkalinity and hydrogen ion concentration. These instruments included microscopes, potentiometer pyrometer con-

trollers, temperature controllers, pressure controllers, recording resistance thermometers and hydrometers, indicating pyrometers, industrial thermometers, etc.

Factory Features and Dust Collecting

Factory equipment on display included safety devices, fire extinguishing equipment, industrial wash fountains, etc., and explosion protective safety heads of nickel, copper and Monel metal.

Dust collecting systems were shown by ten exhibitors ranging from the exhauster and bag type of electrostatic precipitators.

Exhibitors

Among the firms which exhibited products which use metals or which are used for metal manufacturing, and their displays, were the following:

Alsop Engineering Corp., Milldale, Conn. Mixers for liquids.

Aluminum Co. of America, Pittsburgh, Pa. Aluminum and aluminum alloys for chemical equipment.

American Hard Rubber Co., 11 Mercer St., New York. Hard rubber chemical process equipment.

Andrews Lead Co., Inc., 30-48 Greenpoint Ave., Long Island City, N. Y. Lead lined pipe.

Baker & Co., Inc., Murray & Austin Sts., Newark, N. J. Platinum and platinum products.

Barnstead Still & Sterilizer Co. Inc., 2 Lanesville Terrace, Forest Hills, Boston, Mass. Solvent recovery stills.

Bartlett & Snow Co., C. O., 6200 Harvard Ave., Cleveland, Ohio. Dust collectors.

Bausch & Lomb Optical Co., Rochester, N. Y. Metallurgical microscopes.

Bishop Co., J., Platinum Works, Malvern, Pa. Platinum and platinum ware.

Bristol Co., Waterbury, Conn. Process control instruments.

Brown Instrument Co., Wayne & Roberts Ave., Philadelphia, Pa. Process control instruments.

Buffalo Foundry & Machine Co., Buffalo, N. Y. Blowers and exhausters.

Carborundum Co., Niagara Falls, N. Y. Abrasives and abrasive wheels; refractories.

Coleman Electric Co., 310 Madison St., Maywood, Ill. pH meters.

Commercial Solvents Corp., 230 Park Ave., New York. Solvents.

Despatch Oven Co., 622-9th St., N.E., Minneapolis, Minn. Laboratory and industrial ovens.

Dracco Corp., Cleveland, Ohio. Dust control; fume control; material handling; filters.

Fansteel Metallurgical Corp., North Chicago, Ill. Tantalum and tantalum products.

Foxboro Co., Foxboro, Mass., Process control instruments.

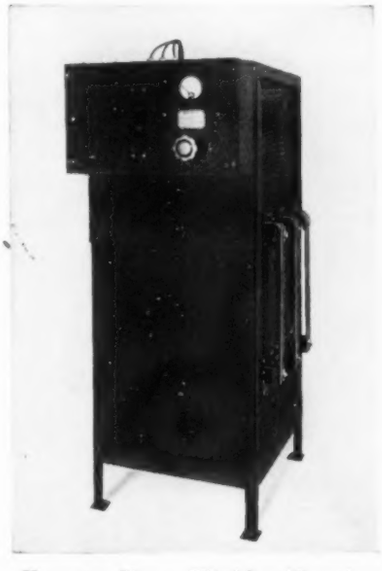
Glyco Products Inc., 148 Lafayette St., New York. Emulsifying agents; wetting agents; water soluble resins.

Great Western Mfg. Co., Leavenworth, Kans. Gyratory riddles.

Haveg Corp., Newark, Dela. Corrosion resisting tanks and equipment.

Hellige Inc., 3712 Northern Bldg., Long Island City, N. Y. pH meters.

Illinois Testing Laboratories Inc., 420 N. La Salle St., Chicago, Ill. Process control instruments.



Hanson-Van Winkle-Munning rectifier for producing low-voltage direct current for electroplating

International Nickel Co., 67 Wall St., N. Y. Nickel, nickel alloys, Monel metal, etc. for chemical manufacturing equipment; nickel plated products.

Knight, Maurice A., Kelly Ave., Akron, Ohio. Chemical resistant stoneware.

Koven & Bro., Inc., L. O., 154 Odgen Ave., Jersey City, N. J. Steel and other metal tanks.

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Process Control instruments.

Leitz, Inc., E., 730 Fifth Ave., New York. Metallurgical microscopes.

Luzerne Rubber Co., Trenton, N. J. Rubber and rubber lined valves, etc.

Mallory, P. R. & Co. Inc., Indianapolis, Ind. Alloys for resistance welding and other applications.

Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa. Safety equipment.

National Lead Co., 111 Broadway, New York. Lead lined equipment.

National Technical Laboratories, 3330 E. Colorado St., Pasadena, Calif. pH meters.

Norton Co., Worcester, Mass. Refractories; abrasives; abrasive wheels.

Palo-Myers, Inc., 81 Reade St., New York. Laboratory equipment.

Pangborn Corp., Hagerstown, Md. Dust collectors.

Pfaltz & Bauer, Inc., Empire State Bldg., New York. Microscopes; pH meters.

Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa. Industrial dryers.

Philadelphia Quartz Co., 121 S. 3rd St., Philadelphia, Pa. Silicates of soda.

Quigley Co., 56 W. 45th St., New York. Refractories and cements.

Republic Chemical Machinery Co., 154 Nassau St., New York. Reflectometer for measuring light reflection from metal.

Schneible Co., Claude B., 3951 Laurence Ave., Chicago, Ill. Dust collectors.

Shriver & Co., T., Hamilton St. & Franklin Ave., Harrison, N. J. Filters.

Tagliabue Mfg. Co., C. J., Park & Nostrand Aves., Brooklyn, N. Y. Process control instruments.

Taylor Instrument Companies, Rochester, N. Y. Process control instruments.

Taylor & Co. Inc., W. A., 872 Linden Ave., Baltimore, Md. pH meters.

Tolhurst Div., American Machine & Metals Inc., 100-6th Ave., New York. Centrifugal dryers.

U. S. Stoneware Co., 60 E. 42nd St., New York. Chemical resistance stoneware equipment.

Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. Rectifiers for producing low voltage DC from AC.

Zapon Div., Atlas Powder Co., Wilmington, Dela. Lacquers, enamels, synthetics; industrial finishes.

Zeiss, Inc., Carl, 485-5th Ave., New York. Metallurgical microscopes.

The Recovery of Silver, Gold and Mercury from Precious Metal Amalgams

By C. M. HOKE

Consulting Chemist, The Jewelers Technical Advice Co., New York

Sources of Amalgams

SILVER amalgam is widely used in dentistry, being an inexpensive and useful material for filling cavities. Any accumulation of dental wastes is likely to contain bits of amalgam. In addition to silver and mercury, dental amalgams normally contain tin, copper and zinc with occasional other base metals. Accidental admixtures of gold and platinum, which are also widely used in dentistry, are always possible, and these metals should not be ignored in any scheme of refining.

Gold amalgams are found occasionally in the jewelry shops and in shops where gold leaf is handled. Large quantities of gold amalgam are formed in the winning of native gold, both large and small gold mines employing the amalgamation process; and prospectors depend upon it.

Silver amalgams of the type used in dentistry are of low intrinsic value, and the recovery of the value they contain is not apt to be profitable, especially when they are handled in small quantities. Gold amalgams, on the contrary, may be very valuable.

Briefly, the process of refining amalgams—either gold or silver—consists of the following steps:

(1) Distilling off the mercury.

(2) Melting up the residual metal, which will be impure.

(3) Purifying the silver or gold button.

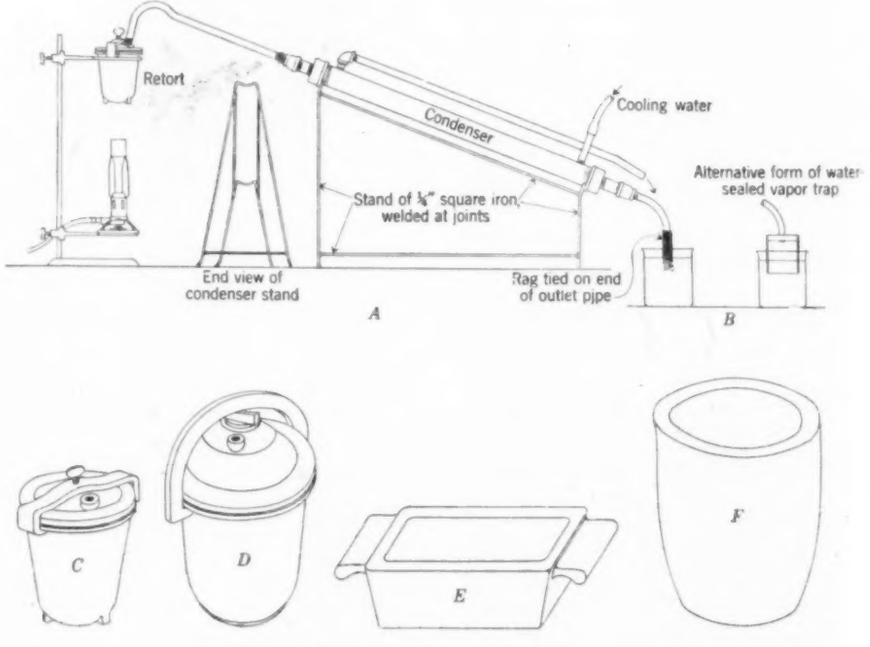
The United States Bureau of Mines has published a pamphlet entitled "Placer Mining in the Western United States; Part II—Hydraulicking, Treatment of Placer Concentrates, and Marketing of Gold," by E. D. Gardner and C. H. Johnson. It contains considerable information on gold amalgams, much of which is equally applicable to silver amalgams. The following quotation* describes Step 1.

"Distilling Off the Mercury"

"Heating. Although retorting is the common method of separating the gold from the quicksilver in amalgam at dredges and other large-scale operations, the mercury in small quantities of amalgam may be volatilized by simple heating. A common method is to heat the amalgam on a clean iron surface over an open fire until all the mercury is driven off. This is the usual expedient of the single miner or small operator who does not object to the loss of the quicksilver. The mercury vapor may appear as heavy white fumes. Whether visible or not, mercury vapor is exceedingly poisonous, and the work must be done where a draft can be depended upon to carry all vapor away from the operator. Mercury boils at 675°F., which is about half way between the boiling point of water and the first visible red heat of iron. However, it volatilizes at the boiling point of water enough to be dangerous to the health of persons exposed to it.

"In another method of recovering the gold from small amounts of amalgam, a potato is used as a condenser. This device is popular because it is simple, yet saves part of the mercury that would be lost by the method above. A large potato is cut smoothly in half, and in the flat surface of one half a recess is hollowed which should be considerably larger than the amount of amalgam to be treated. The amalgam is placed on a clean sheet-iron surface—for example, a frying pan,—the half potato is placed over it, and the whole is set over a hot fire. Some mercury vapor will escape under the edges of the potato, and, as before, these fumes must be avoided. After 15 or 20 minutes of strong heating the potato may be

*Reprinted from U. S. Bureau of Mines Information Circular 6787, page 81 et seq.



Apparatus for retorting amalgams. A, set-up of small retort; B, water-sealed vapor trap; C, amalgam retort; D, Nevada type retort; E, bullion mould; F, graphite crucible.—Reprinted from U. S. Bureau of Mines Information Circular 6787.

lifted off for inspection. If all the mercury is gone from the gold the potato may be crushed and panned, and a considerable part of the mercury will be recovered.

"*Retorting.* A very small amount of amalgam can be retorted in the laboratory in a glass tube 18 to 24 inches long, sealed at one end and bent 2 or 3 inches from that end to a slightly acute angle. A large tube ¾ inch in diameter is best. The amalgam is broken into small pieces and dropped into the closed end, where it is then heated, the fumes condensing in the long open end of the tube.

"The typical quicksilver retort for placer mines (*C* and *D* in the sketch) is a cast-iron pot with a tight-fitting cover in which a hole is tapped to accommodate the condenser pipe. The capacities of such retorts range from about a quarter pint to 2 gallons. They are listed in chemical-supply catalogues as from $4 to $30, not including the condensers. The condenser commonly used with this type of retort is an iron pipe 3 to 4 feet long, leading from the hole in the retort cover at a downward angle of 20 to 30°; it is encased for most of its length in a considerably larger pipe through which cooling water is circulated. When heat is applied to the charged retort the mercury vapor enters the condenser pipe where it cools and condenses; it trickles down the pipe into a vessel placed under the open end of the pipe.

"The retort may be heated over a large Bunsen burner, by a gasoline blow torch, or the like. Very high temperatures are unnecessary, and a wood fire is considered better than a coal fire. The flame should cover as much of the retort as possible.

"A rigid, strong stand for retort and condenser (*A* in the sketch) should be constructed if the apparatus is to be used regularly.

"The retort should be coated on the inside with chalk, or painted with a thin paste of clay, a mixture of fire clay and graphite, or the like, and well dried. This prevents the gold from sticking to the iron. A lining of paper serves the same purpose, but tends to form an objectionable deposit in the condense pipe.

"The retort should not be filled over 2/3 full of amalgam (1/3 or ½ full when retorting liquid mercury), otherwise some of the contents may boil into the condenser tube. The amalgam is broken into pieces and piled loosely. Then the cover is clamped on tightly, first making sure that the attached condenser pipe is free of obstructions. The joint between the cover and body of the retort is seldom tight enough to prevent leakage, and should be luted with some sealing compound. One satisfactory cement is a mixture of ground asbestos and litharge with glycerin.

"A low heat is applied at first, then after 10 or 15 minutes the temperature is increased enough to start the mercury vaporizing and condensing. Only enough heat should be used to maintain a steady trickle of quicksilver. When no more mercury appears the temperature should be increased for a few minutes to red heat; then the fire should be withdrawn and the retort allowed to cool. Some mercury vapor always remains in the retort, and the operator should take care not to breathe these fumes when taking off the cover.

"The likelihood of dangerous amounts of mercury vapor passing through a long cold pipe without condensing is small. However, if much amalgam is to be retorted, it is desirable to provide a water seal to prevent the escape of such fumes. Many miners have followed the dangerous practice of submerging the end of the condenser pipe in the water used to receive the condensed mercury. This should not be done; a slight cooling of the retort causes water to be sucked back into the pipe, and if the water reached the retort an explosion would follow. Such an explosion has taught more than one oldtimer the danger of this practice.

"The simplest method to avoid this danger is to tie a piece of canvas around the end of the condenser pipe and let it dip in the water 2 or 3 inches below. This will condense any vapor, yet not be tight enough to permit water to be sucked into the retort."

When zinc is present, as in dental amalgams, it is imperative not to heat the retort too strongly, or zinc will volatilize and come over, clogging the condenser pipe.

Melting the Residual Metal

A crust or sponge of metal remains in the retort. It often contains some mercury which failed to be driven out in the first operation. Sometimes it is sold or refined as it is, but generally it is first melted, in a gold-melting furnace, with a flux such as borax glass. This second melting, of the crust or sponge, is sometimes the most dangerous part of the process, as the mercury fumes are so heavy that they do not go up the flue unless the draft is unusually good, but seep into the building and cause illness among the workers.

Aside from this hazard, this step does not differ markedly from the routine melting that is carried out in every jewelry shop or dental laboratory. The molten metal may be cast into an ingot mold, or possibly granulated in water, as circumstances will dictate.

Purifying the Gold or Silver

The gold obtained in the above process is usually of such character as to be easily refined or readily sold; sometimes it is nearly fine gold. Ordinary routine refining methods are suitable; either the acid methods used in jewelry shops and small refineries, or the electrolytic processes employed by the large refineries and Mints.

The silver obtained from dental amalgams, however, is not so promising. It always contains tin and other base metals, and usually is of low value. It is possible to refine it by acid methods, of course, but the process is made tedious by the tin, and the amount of acid and labor required is usually so great as to make the job highly unprofitable. In most cases the best disposal of such metal is to a silver buyer; or it may be melted up with sufficient other metal as to make it salable to the Mint.

However, as we said at the beginning, there is always the possibility of accidental admixture of gold or even of platinum particles, since these metals are present in most dental wastes. Accordingly a test for these elements is always in order, and if they are present in worthwhile proportions, acid refining may be advisable.

Shop Problems

CASTING • METALLURGICAL FABRICATION • ASSEMBLING • • PLATING • FINISHING

Questions from readers relating to shop practice and answers by our associate editors

Cleaning Aluminum

Q.—Please tell us of a quick way of removing burned on deposit from aluminum cooking utensils.

A.—No entirely satisfactory way is known for completely removing burned in deposits of grease etc. on aluminum.

Among methods suggested is the use of scouring with steel wool and soap, and immersing in boiling dilute solution of acetic acid. The Aluminum Co. of America, Gulf Bldg., Pittsburgh, Pa. should be consulted.—G. B. H., Jr., Problem 5,630.

Cleaning Flat Wires

Q.—We have a rust removing and cleaning problem on which we think you may be able to help us.

One of our products consists of a series of fine gauge highly polished flat wires running parallel to each other and soldered at each end, as many as 60 wires per inch in some cases. We want to remove discoloration from corrosion by dipping or soaking, say, overnight. A solution is required which will remove grease and dirt and either remove or loosen rust to such a point that it can be easily brushed out. In addition, the solution, should be such that it will not cause rust. Finally, it is desirable that the solution be highly volatile; it is difficult to brush out or dry and fluid and if a mixture that would evaporate quickly could be obtained, it would be of great benefit.

A.—The removal of grease and of rust from the reeds will have to be done in two different solutions as solutions for cutting the grease and dirt will not remove rust.

For grease removal a solvent can be used, such as gasoline or xylene, due fire precautions being taken. A solvent vapor degreasing machine is very effective in grease removal.

After solvent degreasing, the reeds can be further cleaned by an alkaline cleaning solution. This solution can be either of the immersion type (containing usually a soap) or the electric cleaner type, using direct current.

If the solvent degreasing is not used, and if the grease is not too heavy or resistant the alkaline cleaner alone may be used, either type, although the removal of greases by alkaline cleaners alone usually requires a soak in an immersion cleaner, rinse, and an electric cleaner. For advice on details of type of cleaner, and method to use, suggest you get in touch with manufacturers of commercial cleaners such as advertise in the METAL INDUSTRY.

The removal of rust from steel is most economically done in a weak solution, (5 to 15%) of hydrochloric acid. Another solution used for removing rust from steel is composed of ammonium citrate. This is made by taking about 10 ozs. of citric acid, dissolving in some water, and neutralizing the solution with ammonium hydroxide (neutral when litmus starts to turn blue). The resulting ammonium citrate solution is diluted to one gallon. In the cold it takes several hours to remove rust. The action is more rapid if the solution is heated.

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Use this Blank for Solution Analysis Information

Fill in all items if possible.

Date .....

Name ..... Class of work being plated: .....
Address ..... City ..... State ..... Volume used: .....
Employed by: ..... Solution depth: .....
Kind of solution: ..... Cathode surface, sq. ft.: .....
Tank length: ..... width: ..... Kind of anodes: .....
Anode surface, sq. ft.: ..... Distance from cathode ..... Original formula of solution: .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary. _____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

In the case of using hydrochloric acid, thorough rinsing is required or else rusting will develop again rapidly. After rinsing, the reeds can be dipped in a boiling water containing a small amount of a good grade soap, and allowed to dry in an air blast. The soap film remaining will provide a slight protection against rust.—G. B. H. Jr., Problem 5,631.

Copper Plating

Q.—1. Is there any danger attending the mixing or operation of a copper cyanide bath? If so how can such danger be circumvented?

2. Is it absolutely necessary to copper steel prior to nickeling and chroming?

3. Is it possible to copper steel in an acid bath by coating it with some arsenic compound prior to plating?

4. What is the simplest way to strip nickel?

A.—There is no danger in the mixing of a cyanide copper solution if ordinary precautions are observed.

There will always be a slight cyanide odor during the handling or mixing of a cyanide solution but this is not serious although ventilation of some sort should be in use. The present cyanide copper solutions are made from copper cyanide, sodium cyanide, sodium carbonate, and also recently rochelle salts. It was formerly common to use copper carbonate in mixing copper solutions. When copper carbonate is mixed with sodium cyanide, some cyanogen is given off and while this is not as poisonous as hydrocyanic acid gas the inhalation of it should be avoided.

Acids and cyanides should never be mixed as the result will be the release of hydrocyanic acid gac, which is highly poisonous. If cyanides get into cuts or abrasions in the skin "cyanide sores" will occur and while these will be painful they eventually will heal. Ointments are on the market for the treatment of cyanide sores. In short, cyanides should not be allowed to come in contact with open cuts in the skin, and should not be handled in confined places.

Steel need not be copper plated before nickel plating if the surface of the steel is in good condition. Cyanide copper plating is usually done on steel before nickel for the purpose of obtaining better adherence of the plate on steel that has a poor surface either due to rusting, or due to being a refinished job, or from imperfections in the metal itself. Copper will cover the imperfections more readily than nickel.

The use of an arsenic dip on steel followed by acid copper plating is not recommended as the adherence is not always consistently good.

Nickel can be stripped from brass or copper by making the work anode in a 5% hydrochloric acid solution. Nickel can be stripped from steel by making work anode in a solution composed of 1 gallon of sulphuric acid, 1 quart of water.—G. B. H. Jr., Problem 5,632.

Removing Nickel from Contacts

Q.—We are having difficulty removing nickel which deposits on our brass cathodes. We do our nickel plating in a rotating barrel plater, using nickel anodes, and brass cathodes. The electrolyte is a Thompson Solution (i. e. nickel sulphate, sodium sulphate, ammonium chloride, and boric acid).

Is it possible to use another type of cathode that the nickel will not adhere to, or can you suggest a method whereby we can recover the nickel deposit on the cathode.

A.—In some cases contacts such as described have been chromium plated in order to prevent adherence of the deposited metal. This practice is not always advisable, however, due to the fact that the deposited metal will tend to come off in flakes or in a powder that will become suspended in the solution and cause rough work.

No good method is available for recovering the nickel directly from contacts. Suggest you obtain prices offered for scrap nickel from metal buyers such as advertise in the METAL INDUSTRY.—G. B. H. Jr., Problem 5,633.

Yellow Brass Solution

Q.—Would you be kind enough to give me the correct method of making up a brass solution of 40 gallons to produce a good yellow brass for barrel plating.

A formula I have is as follows (40 gallons).

Cyanide 98%	25 lbs.
Copper cyanide	16 lbs.
Cyanide 98%	5 lbs.
Zinc cyanide	4 lbs.
Soda ash	3 lbs.

Has this formula to be doubled for barrel plating or not; or 25% in excess?

A.—We refer you to page 16 of the 1937 edition of Platers' Guidebook, which is obtainable from the METAL INDUSTRY, for the following brass formula:

Copper cyanide	3.6 ozs.
Zinc cyanide	1.2 ozs.
Sodium cyanide	7.5 ozs.
Sodium carbonate	4.0 ozs.
Water to make	1 gal. (U. S.)

This solution can be used satisfactorily in a barrel.

The temperature should be from 75 to 100 deg. F.

Use brass anodes of a composition of 80% copper and 20% zinc.

The replenishing of the solution is done by adding zinc cyanide, copper cyanide, or sodium cyanide, in the necessary amounts as can be found by making an analysis of the solution. For example, above formula calls for 3.6 ozs./gal. of copper cyanide, which is about 2.5 ozs./gal. of copper. If the analysis shows 2 ozs. of metal, then you need to add 0.5 oz. of copper which, in the form of copper cyanide requires the addition of 0.7 oz./gal. of copper cyanide. (Metal content of copper cyanide is 71%). The zinc is figured similarly (Metal content of zinc cyanide is about 55%).

When adding metal cyanides you must also add some sodium cyanide to take them up. One part of copper cyanide requires one part of sodium cyanide, and one part of zinc cyanide requires 0.83 parts of sodium cyanide to bring into solution.

It is not advisable to replenish a brass solution by making up a replenishing solution, as this will not add the salts in the same proportion at all times, as they are depleted from the solution by plating and by drag out.

An important point in maintaining a good brass is to keep the metal ratio in the solution constant when the best point has been found. This is usually 4 copper to one of zinc. and is ratio given in formula above.

Recent work has also shown the importance of maintaining the pH of a brass solution.

—G. B. H., Jr., Problem 5,634.

Metal Casting Digest

Short abstracts of articles of interest to practical non-ferrous foundrymen and metallurgists

By H. M. ST. JOHN
Associate Editor

Heat Conductivity of Mould Materials. F. Hudson. Metal Industry (London), May 21st, 1937, page 573.

Metal moulds have high conductivity but are subject to various disadvantages which can be overcome by the use of a high-conductivity plastic mixture. The author describes apparatus for testing conductivity and tests made with various mixtures containing graphite and carborundum, also other materials. It was found that ordinary moulding sands have a low and fairly constant thermal conductivity, and that it is practical to produce moulding compositions having a conductivity superior to steel and nearly equal to copper. Phosphor bronze cast in a moulding composition containing 97% carborundum, 2% bentonite, 1% liquor binder, 2% water, had properties equivalent to a chill casting. All of the mixtures tried could be used over and over again.

• • •

Soundness in Step Castings. E. Longden, Metal Industry (London), May 21st, 1937, page 579.

There is a tendency to substitute true bronzes for copper-tin-zinc bearing alloys. The author discusses 89 copper, 11 tin and 88 copper, 10 tin, 2 lead, goes into detail regarding molding practice and gating.

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A Large Leading Nut Casting. E. Longden, Metal Industry (London), May 28th, 1937, page 603.

Describes the methods used to produce a sound casting weighing 900 lbs. which had to be machined all over, composition — copper 88%, tin 11.85%, phosphorus 0.15%.

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Unformity in Metals and Alloys. C. C. Paterson. Metal Industry (London), June 4th, 1937, page 629. The materials and processes employed in the manufacture of metal products have, as a rule, been controlled only so far as has been necessary to obtain a reasonable measure of uniformity. What seemed like excessive care taken to obtain a uniform product has frequently turned out to be very profitable. The average manufacturer must choose between two psychologies: "One which cannot apply refinements and careful manufacturing control because of cut market prices. The other which must apply refinements and controls because prices are so cut."

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Inverse Segregation in Ring Castings. E. Longden. Metal Industry (London), June 4th, 1937, page 631. Discusses the details in making a casting 8 ft. 7½ in. in diameter with a section 5½ in. by 2¼ in. Composition 85 to 86% copper, 9 to 9.5% tin, 5 to 5.5% lead, trace of phosphorus. Better results are obtained if some nickel (amount unstated) is used.

• • •

Soybean Oil in the Foundry. Lamar Kishlar. Proc. 15th Ann. Meeting Am. Soybean Assoc. 1935, page 19; Chemical Abstracts, June 10th, 1937, col. 3840. Soybean oil meets all the requirements for an excellent oil in the making of foundry cores. Castings that have been cleaned, dipped in soybean oil and allowed to drain and dry, remain clean and bright even after several weeks outside storage.

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Study of Gases in Aluminum. Leon Moreau. Bull. Assoc. tech. fonderie, vol. 10, page 446 (1936); Chemical Abstracts, June 10th, 1937, col. 3840. The gases found in aluminum have been extracted by placing the crucible with molten aluminum in an evacuating metal container. The following results were obtained on extraction of gases from aluminum. Cooling in vacuum—7.3 cc. gas/100 g. metal (0.07 cc. carbon dioxide, 1.6 cc. carbon monoxide, 4.15 cc. hydrogen and 1.46 cc. nitrogen) and by the vacuum discharge tube the 100 grams aluminum gave 160 cc. of gas (4.8 cc. carbon dioxide, 44.8 cc. carbon monoxide, 110.4 cc. hydrogen).

Elimination of Gaseous Impurities from Aluminum. Georges Chaudron. Metal. Ind. (London), June 11th, 1937. The extraction of gases from metals by the use of a high vacuum alone is a very slow and incomplete operation, but if the sample is made cathode in a discharge tube the contained gases are liberated much more rapidly and completely. In a series of tests the author compares this new method with others and finds it to be much more accurate. He also concludes that considerable quantities of hydrogen, carbon monoxide and nitrogen remain in solution in the solid metal, as if in equilibrium with it, and that from dissolved gases in this equilibrium the foundryman has nothing to fear.

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The Use of Nickel in Non-Ferrous Alloy Castings. J. O. Hitchcock. Metal Ind. (London), June 11th, 1937, page 659. A review, giving a list of alloys; indicates the effect of nickel in each.

• • •

Physical Factors in Casting of Metals. C. H. Desh. Metal Ind. (London), June 18th, 1937, page 680. The author suggests the term "flowing power" rather than "fluidity" or "castability" to describe the ability of molten metal to "flow evenly into the mould and fill it completely before such freezing occurs as to offer an obstruction to its further flow." The value obtained by experiment for flowing power depends (1) upon the conditions under which the experiment is conducted (2) the quality of the metal. The viscosity of metals is not great (usually less than that of water) and this is not an important factor. Apparent viscosity is due to a tough skin on the surface of the metal or to a foam of gas bubbles. Most important cause of diminished flowing power is the obstruction of the channel by growing crystals attached to its walls. Methods of determining these various qualities are described and their relative importance evaluated.

Modern Production Equipment

New processes, machinery and supplies for metal products manufacturing and metal finishing

Rotary Spray Finishing Machine

The DeVilbiss Co., Toledo, O., announces a new improved rotary spray-finishing machine, Type YB, for high speed automatic finishing of small and medium size articles. This machine is capable of an approximate production up to and exceeding 3,600 finished, small, light weight articles per hour.

The machine is equipped with spindles, automatic spray gun, automatic control valve, hose connections and other complete accessories of the modern spray-finishing unit. Unit is available in three sizes for light, medium and heavy duty.

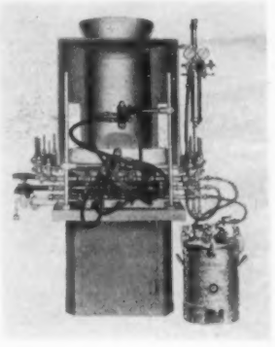
All sizes are equipped with improved speed reduction unit, and may be operated at several different speeds to fit the requirements of the operation. If desired the machine can be provided with a cam so that the spray gun operates at every second spindle when the machine is used for the finishing of larger articles.

The turntable is driven by a ¼ H.P. electric motor, the speed of which is determined by the work to be done. Turntable will accommodate 15, 20, 25, 30, 40 and 50 spindles, number of which is dependent on the size of the pieces to be sprayed.

Exhaust chamber can be furnished specially designed to meet the individual requirement. The machine may be equipped with a drying oven if desired.

A few of the features claimed to make this machine a real contributor to efficient and economical spray-finishing are:

Control of spraying period of adjustable cam—results in saving of material.



DeVilbiss Type YB rotary spray finishing machine

Speed limitations of machine governed only by ability of operator to load and unload pieces to be sprayed.

All shafts rotate on roller bearings in continuous oil bath.

Rotating tables up to 60″ diameter available.

Seal to prevent finishing material from entering ball bearing spindles to top.

Simplified header system to accommodate four guns.

Air Operated Potentiometer Controllers

A new control instrument, designed by the Mason-Neilan Regulator Co., 1190 Adams St., Boston, Mass., is a combination of the company's air-operated control and a potentiometer system of temperature measurement. It is designed for such applications as solvent extraction units, gas or oil-fired or electric furnaces and ovens. The instrument measures, indicates, records and controls; requires approximately 20 lbs. of operating-air supply. It uses 10-in. strip chart approximately 120 ft. in length, sufficient for a continuous record through 5 to 60 days, depending on chart speed.

The controller is actuated by an emf. set up by a thermocouple or resistance thermometer. A standard emf. is continually balanced against this emf. When the system is balanced the galvanometer pointer is at zero. Temperature change at the point of measurement results in proportionate change in the thermocouple emf., unbalances the potentiometer system and creates a flow of current. This current causes deflection of the galvanometer pointer which is engaged by a motor-driven balancing mechanism. The mechanism rotates a slide wire disc to adjust the standard emf. until balance is restored.

(*Continued on page* 28)

Mason-Neilan air operated potentiometer controller

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Industrial Spotlight. Intensifier for illumination at the tool point of machines or over small areas of work benches. Benjamin Electric Mfg. Co., Desplaines, (suburb of Chicago), Ill.

Combination Mercury and Incandescent Lamp Dome Units. Visually comfortable and blends well with daylight. Benjamin Electric Mfg. Co., Desplaines (suburb of Chicago).

¼″ Low-Speed Ball-Bearing Electric Drill; for stainless steel, Monel and other hard metals. The Black and Decker Mfg. Co., Towson, Md.

Mercury Vapor Detector; for determining the presence of mercury vapor in the air. Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

Pneumatic Transmission System for Remote Measurement with Air Operated Control; for measurement of process variables in atmospheres containing explosive gases where electrical measurement is not permissible. Brown Instrument Co., Phila.

Explosion Proof Squirrel Cage Motors; AC, with mounting dimensions conforming to N.E.M.A. standards. Reliance Electric & Engineering Co., Cleveland, Ohio.

9-Inch Workshop Precision Lathe. Seven different types to fit a variety of installations. South Bend Lathe Works, South Bend, Ind.

Hacksaw Container. A new and unique method of packaging hacksaws to prevent splitting and disfigurement in shipment, spoilage due to moisture, scratching, etc., is provided by *Clemson Bros. Inc.* and *Victor Saw Works, Inc.*, designed by *O. S. Tyson and Company, Inc.*, 230 Park Ave., N. Y.

Nine-Inch Swing Lathe; with 1⅝″ hole through the spindle and 1-inch collect capacity. South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

Universal Mauser Vernier Caliper. Made entirely of stainless Steel. George Scherr Co., 128 Lafayette St., New York City.

Multiple Recording Potentiometer Pyrometer. Many new features in the multicolor numeral printing potentiometer pyrometer. Brown Instrument Company, Philadelphia, Pa.

(*Continued from page* 27)

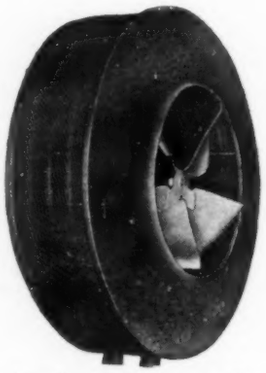
The extent of the rotation of a slide wire is a direct indication of temperature and is used for positioning the pen arm on the recording chart.

The slide wire actuates an independent control mechanism by means of a cam and a mechanically-connected ball-bearing shaft. It raises and lowers the control arm in proportion to the temperature change. The control valve is then automatically positioned to regulate flow of processing medium.

Projection Unit Heater

The new Projection Heater has just been added to the unit heater line of the Trane Co., La Crosse, Wis. This heater, a light weight, compact high velocity unit of the propeller type, is a development of a novel means for conveying the natural reservoir of warm upper air in a building down to the floor—the occupied zone. It provides velocities equal to those obtainable with blower types, but in a vertical air stream, said to be more suitable for the distant projection of warm air from considerable heights. The Trane projection heater, it is stated, both diffuses the air stream and carries it a considerable distance at the same time.

A two-row circular coil is mounted between two circular plates. The circular construction of the coils takes care of normal contraction and expansion. The upper plate is the supporting backbone of the unit. The lower provides the orifice through which the fan discharges. The motor is mounted out of the direct path of the air on a three-point resilient construction to prevent motor noises from being telegraphed to the metal parts of the unit.



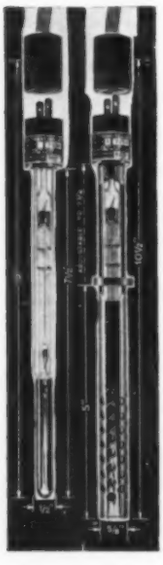
Trane Projection Unit heater

This unit is primarily designed for ceiling mountings where its inherent operating characteristics function best. The warm upper air is *drawn through* the coils and then projected straight downward to the floor by the new Trane four-blade propeller fan. This initial high velocity air stream reaches the floor zone at a negligible velocity with a tendency to spread and blanket the floor.

The Trane Projection Unit Heater is described in detail in Trane Bulletin No. 284.

Thermo Regulators

A new instrument designed to make accurate temperature control a simple matter for the operator, is announced by the H-B Instrument Co., 2518 N. Broad St., Philadelphia, Pa., called Red Top Thermo-Regulator. This device, illustrated below, is designed to control temperatures within 1/10 of 1 degree F., and the range of application is adjustable to minus 30 deg. to plus 500 deg. F. It can be supplied in either armored or the unarmored type.



H-B Red Top thermo-regulator

The unit is recommended for constant temperature baths or other critical temperature applications, solutions, ovens, etc. It is also adaptable for humidity control, with the addition of a wet wick to the bulb of the unit.

The company supplies a complete line of specially designed sensitive relays to operate with the sensitive units. Full information is given in Blue Book, Part 4, available on request.

Perspiration-Proof Lacquer

A new type of clear lacquer that is resistant to perspiration has been developed by Maas & Waldstein Co., makers of industrial finishes, Newark, New Jersey.

This lacquer is applied by dipping or spraying and air-dries out of dust rapidly. After hardening for a few days, it becomes practically insoluble and resistant to moisture, soap and water, and perspiration. It is useful for finishing products, such as flashlights, that are constantly held in the hands.

Used on steel products, this lacquer provides a much higher degree of protection against rusting than ordinary lacquers, according to the manufacturer. It is also supplied in grades suitable for finishing copper, brass, and aluminum.

Bright Pickle

Industro Bright Pickle is a new non-fuming non-tarnishing product manufactured by the Industrial Chemical Products Company, 3777 Belleview Ave., Detroit, Mich. It is designed to remove all tarnish and oxide film from the surface of brass and to impart to it a durable and attractive satin finish.

Industro Bright Pickle is made in concentrated form and diluted with three parts of water. It is used at room temperature. Articles to be pickled are first cleaned with a hot alkali cleaning solution. (Industro 5B, a cleaner used for brass without tarnishing, is particularly recommended for this purpose), and then immersed for about one minute in the Industro Bright Dip solution. The pickled article is then rinsed, preferably in hot water, and allowed to dry.

The desirable results described are secured, it is stated, by the formation of an invisible and protective chemical coating on the surface of the metal. No lacquer is used.

Heavy Duty Buffer

To meet the requirements of heavy duty buffing with unusual distance beteen wheels, in a "Motor in Head" type of machine, The Production Equipment Company of 5219 Chester Avenue, Cleveland, Ohio, offer their Type 322W.

This is a heavy machine designed with 4 bearings and furnished with a spindle of very liberal size. The diameter of the spindle extension adjacent to the outside bearings is 1 13/16". The spindle housing sleeves are designed to allow ready assembly and disassembly.

These designs are built in ratings from 4 to 15 HP, and are furnished with enclosed motor—flanges—nuts—safety type spindle threads—and magnetic starter. The distance between wheels is approximately 4", varying slightly according to the rating of the machine.

When built in 2 bearing construction this general design is designated as Type 322. The 2 bearing machine is furnished with open spindle extension and has a distance between wheels of approximately 3'.

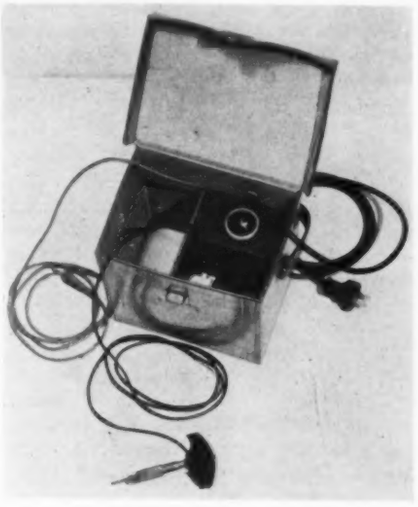
These two designs can be furnished in any desired motor speed, but ordinarily are built for either 1800 RPM or 360 RPM.

Production, Type 322 W, 10 HP, 3600 R.P.M. 4-bearing buffer.

Determining Film Thickness by Penetration

The penetration method has been accepted, more or less generally, because it allows accurate measurement on curved and irregular surfaces, as well as on surfaces with a non-metallic base. The difficulty in the past has been that the stylus used to penetrate the paint or lacquer film has had to carry sufficient electrical current to turn on an indicating pilot lamp when it was supposed that the very point of the stylus touched the bare metal beneath the paint film. Due to the fact that in many cases the indicating lamp consumed as much as .250 ampere, it was not uncommon to find that the stylus had actually made an indenture in the bare metal below the paint film before this portion of the circuit's resistance had dropped to a low enough point in order to pass energy to the indicating lamp. At the moment that the stylus, the point of which is a section of a sphere, comes in contact with a flat metal surface, the two bodies meet at only a point, and if the resistance of the electrical circuit at exactly this time, between the point in the metal surface, is high, the energy, which should be dissipated in the pilot lamp for indication, is actually dissipated in the high resistance circuit between spherical point of the stylus and the bare metal beneath the paint film.

To overcome this detrimental effect the Bathytrol was introduced by the Electronic Control Corp., 2667 E. Grand Blvd., Detroit, Mich. It used the well established method of penetration. The control of the depth of the stylus, penetrating the insulated paint film, is controlled by either a standard micrometer depth gauge, resting on an insulated foot, or a dial indicator where more rapid measurements are required, but in order to eliminate the posibilities of false readings the stylus, itself, is connected to the grid circuit of a simple triode tube, as shown in the accompanying illustration. The bare metal beneath the paint film is maintained at a positive potential, also shown in the circuit, so that when the smallest metallic contact between the stylus and the bare metal is obtained, a few millivolts positive with only a few micro-amperes of current, shift the grid of the tube to a positive position so that the tube's plate circuit passes sufficient current to energize the telephone type relay. This telephone type relay only requires a few milli-amperes,



The Bathytrol for accurately measuring the thickness of paint and lacquer film

which is still considerably less than the normal current passed through an ordinary depth gauge stylus. The contacts of this telephone type relay close as soon as the metal stylus of the Bathytrol makes an infinitesimal contact of the metal base beneath the paint. These contacts control an indicating pilot lamp, which announces to the operator, immediately, the "end point", or at exactly the time that the smallest section of the spherical point of the stylus comes in contact with the bare metal beneath the paint.

Repeated tests on various types of metallic bases, ferrous and non-ferrous, in comparison with all other gauges, are said to have proved the reliability and accuracy of this Electronic instrument, for taking the guess work out of measuring the thickness of paint films.

Stop-off for Chromium Plating

Halowax No. 1014 made by the Halowax Corp., 247 Park Avenue, New York, has it is stated, been found a very satisfactory stop-off material for chromium plating. An example was an experiment recently conducted in which this material was used in combination with a Bakelite product in a printing and engraving plant.

It has been found that the best way to obtain a satisfactory coating is first to cover the part with a suitable varnish. After the second coat has dried, the part is then dipped into the molten Halowax No. 1014, giving it either one or two coats.

Small Wheelabrator Tablast

A moderately priced, small size Wheelabrator Tablast, designed for cleaning small parts, is being marketed by The American Foundry Equipment Company, 408 South Byrkit Street, Mishawaka, Indiana.

Certain types of castings, forgings, or stamped metal parts, are cleaned more satisfactorily on a table type blasting machine like this than in any other way. Fragile parts or pieces which would be scratched or injured in the tumbling process, fall into this class.

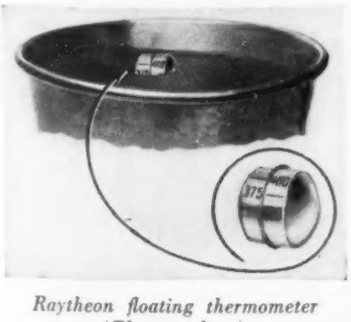
The new Tablast consists of a number of independent tables, the number and diameter of which can be varied. These tables are mounted on a spider which carries them directly under the blast zone. A motor-driven steel disk contacts the tables, rotating them eight times to each foot of travel.

The Wheelabrator unit throws abrasive by centrifugal force. The abrasive cycle is fully automatic. After abrasive is thrown from the wheel, it drops into a tapered hopper which feeds into the boot sections of an elevator. Elevator boots discharge by gravity into a rotary screen, where useless fines are removed. The clean abrasive then gravitates into a storage hopper and subsequently into the Wheelabrator, through a valved control. The abrasive is reused until it is reduced to a metallic dust which is sucked out of the machine by the dust collector.

Floating Thermometer

A new type of "floating" thermometer called the Thermosphere is the product of the Raytheon Mfg. Co., 190 Willow St., Waltham, Mass. Their instrument consists of a chromium plated sphere, 1-¼" in diameter, with figures on the surface indicating the temperature of a given liquid by the uppermost reading. At the present time the Raytheon company has available only one range that reads 350°F, 375°F, 400°F and "Too Hot". It is expected, however, that within a few weeks they will have in production two additional ranges from 0 to 300°F. and from 200°F. to 500°F. These will be graduated in 10° marks and will be accurate within 2-3 per cent.

The Thermosphere is presented as an inexpensive non-breakable device for temperature indication.



Raytheon floating thermometer (Thermosphere)

Wheelabrator No. 48 Tablast

Bright Annealing of Copper Tubing

A new type of bright annealing furnace has recently been installed at the plant of the Roberts Tube Works, Detroit, Michigan.

While the principle of bright annealing is relatively simple and carried out in a great many designs, the general use of these furnaces is handicapped by the rather high first cost and ever increasing cost in maintenance and upkeep. The furnace described below is said to be economical in operating costs.

Figure 1 shows the general appearance of the furnace. It can be described as a U-shaped double deck furnace through which the material is carried on alloy trays pushed

Fig. 1. Bellevue bright annealing copper tube furnace

along by the chain and hook system. When the material has been placed on the charging platform on the upper deck, the trays are pushed into the first of the four sections of the furnace, a non-heated dead end, into which the specially prepared atmosphere has been introduced under sufficient pressure to create air locks which will prevent infiltration of outside air.

The loaded trays are now pushed forward to the second section, an elevator compartment in which the batch of trays descends to the lower deck by the simple use of an automatically working motor-driven worm arrangement.

From here the trays enter the third section, a heating zone in which an alloy muffle protects the material from direct contact with the products of combustion of the fuel used in the heating process.

The last section is the cooling chamber in which the material is being cooled to about 150°F, a temperature sufficiently low to exclude any possibility of oxidation when the trays finally emerge to the unloading platform.

Throughout the sections of the furnace sufficient quantities of the specially prepared atmosphere are being introduced at various points to insure against air infiltrations. This atmosphere is produced in a cracking unit shown in Fig. 2, in which natural gas of 1000 BTU is burned with about six times its volume of air. The resulting product is passed through a sulphur scrubber and through a cooling unit in which all moisture is trapped and the atmosphere cooled to about 36°F. Finally it is carried to the furnace sections as described above.

A typical analysis of the atmosphere shows 4½% CO, 7½% CO_2, with the remainder nitrogen, without a trace of free oxygen.

The fuel used in heating the material is also natural gas of 1000 BTU, introduced through automatically controlled burners, with no possibility of free oxygen attacking the nickel alloy muffle.

The cooling chamber is equipped with a motor-driven fan which forces the atmosphere to circulate through water-cooled radiator fin coils with sufficient velocity to effect a cooling to 150°F within the thirty minutes allotted each cycle of the operation.

The capacity of the furnace illustrated is one ton per hour, with a fuel consumption of only 1200 cubic feet of gas. Of course, the unit may be worked with any of the commonly available commercial gases, the relative overall efficiency and economy being the same in all cases.

The entire equipment has been developed

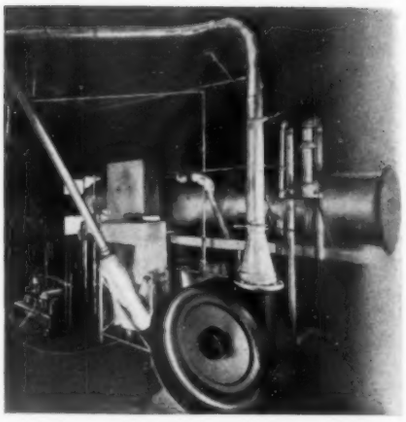


Fig. 2. Bellevue cracking unit for bright tube annealing furnace

by the Bellevue Industrial Furnace Company of Detroit, Michigan. Patents covering the various features of design and arrangement are held by P. J. McIntyre, former Chief-Engineer of the Wolverine Tube Company and for more than twenty-five years identified with the copper industry. The sole manufacturing rights are retained by the Bellevue Industrial Furnace Company.

Brilliant Finish on Chrome

By **WILFRED S. MC KEON, *President***
SULPHUR PRODUCTS CO., INC., GREENSBURG, PA.

The advent of chromium plating brought about many problems. Quite a number of these have their origin in cleaning proceedures. Everyone in the plating industry is aware of the fact that a great deal has been done along the line of developing cleaning processes prior to nickel, copper, and zinc plating. It is true, however, that scarcely anything has been done to develop a cleaner to clean nickel prior to chromium plating. A great need has been felt throughout the plating industry for a successful cleaner built especially for this purpose.

In most plants there are many rejections due to frosty chromium deposits. These generally can be traced to the cleaning of the nickel plate. The platers and inspectors have added quite a few new words to their vocabulary in describing these difficulties. You quite often hear the remarks "chrome fog", "film", "smoky finish", "misty effect", "murky appearance", etc.

If these difficulties were due entirely to the chromium plating processes, they would naturally be on every piece and would be found completely covering each piece. This, however, is not the case. Out of every rack of work there are usually quite a number of good pieces and pieces with a few or many spots having a dull appearance. This means that every piece has to be inspected carefully. Those rejected are very costly to the manufacturer due to reworking expense. When estimates are made on costs, reworking cost is something that is hard to predict exactly. When it occurs, it usually comes out of the profit account. It is obvious therefore, that this profit-destroying hinderance must be eliminated. There must be a perfect cleaner used for cleaning nickel plate before chromium is applied. It should have the following characteristics:

1. It should be so prepared that it will function immediately after cleaning solution is made up. (There must be no "breaking-in" period.)
2. It must not oxidize or tarnish the nickel.
3. It should be capable of operating at a temperature of 170° to 212°F.
4. The cleaner should be free rinsing.
5. It should maintain its strength comparable with any other good metal cleaner made for use before nickel or other plating operations.

With these facts in mind this company set about to prepare a cleaner, and after more than a year of research developed Natrolin Chrome Cleaner. Every plant in which this cleaner has been installed has effected marked savings in their chromium costs, due to the fact that their rejects from hazy or frosty deposits have been eliminated. The use of this cleaner will bring about a chromium plate which is lustrous and clean. It requires no buffing prior to assembling and packing.

The methods recommended with this cleaner are as follows:

1. Electrically clean with Natrolin Chrome Cleaner, using four to six ounces per gallon of water at a temperature of from 170° to 212°F. Use direct current for five seconds to three minutes. Govern by the type of work to be cleaned.

2. Cold water rinse.
3. Rinse in 15% solution hydrochloric acid.
4. Cold water rinse.
5. Chromium plate.

This cleaner requires no breaking-in and it works equally as well after two weeks of the hardest kind of service, running on an operating schedule of twenty-four hours a day.

Polishing Wheel Heading Machine

A new machine for heading polishing wheels has been introduced by Divine Bros. Company, Utica, N. Y. The following advantages are given:

Saving in time and fatiguing labor.

Saving in polishing grain.

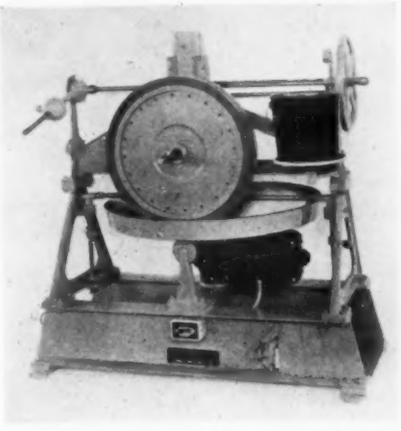
Even coats of abrasives on the polishing wheel to insure even production.

Rapid application of coats so that adhesive sets all at once instead of partially.

Even and regulated pressure used in rolling in the abrasive.

The machine will take wheels of from 8″ to 20″ in diameter and up to 6″ face, straight, concave, convex or grooved. It can also be fitted for wheels larger than 20″ in diameter. Accessory equipment includes one abrasive pan, one cover, three disks (to take care of various diameter wheels), one 1½″ spindle bushing and two extra scrapers.

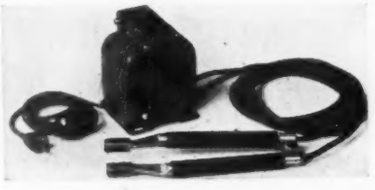
Full directions for use are available from Divine Brothers Company.



Divine polishing wheel heading machine

Electric Soldering Pliers

In answer to the increasing demand for a smaller low capacity soldering unit, that would heat electrically, sweat joints without unsweating adjacent connections, and eliminate the open flame hazards, the Ideal Commutator Dresser Co., 1940 Park Avenue, Sycamore, Illinois, has introduced the new No. 2 "Midget" Type Thermo-Grip Pliers. This tool has been designed especially for soldering small objects and for work in restricted spaces and for ease of operation. A few typical applications are: for soldering small lugs and terminals up to 150 amp., in close quarters on switchboards, motors, generators—for various small radio and appliance soldering—for sweating joints on small copper tubing and fittings up to ⅜″ diameter.



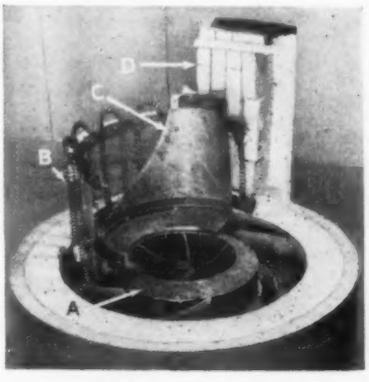
Ideal "Midget" electric soldering pliers

The small power requirement (300 watts) permits the use of the unit on any standard lighting circuit without danger of overloading the circuit or burning out fuses.

Hardening Cadmium Plated Beryllium Copper

The Homo furnace made by Leeds & Northrup Co., 4908 Stenton Ave., Philadelphia, Pa., has been used in a most interesting application. To get uniform heat for identical hardening, the small contact clips of cadmium plated beryllium copper are treated by the International Business Machine Corporation in Homo furnaces. Fifty thousand at a time were put into a pre-heated furnace in which, a blast of electrically heated air, brings them to 530 deg. F., and holds them there for a 45-minute soak. The experimental work on this type of hardening is now completed and the operation is being carried on in new and larger furnaces of the same type.

The principle of the Homo furnace is forced convection tempering, a short, wide path for forced convection air. The furnace is automatically temperature controlled so that the heat treater has only to set a dial in order to shift from any temperature to any other temperature within the range.



Leeds & Northrup Homo furnace

Abrasive Bond

Nuglu, a new abrasive bond, which it is claimed, is superior to cement or glue, has been announced by J. J. Siefen Co., 1936 W. Lafayette Blvd., Detroit, Mich. It is used for setting up all kinds of polishing wheels, belts or discs with all or any size abrasives. It is said to stay the same consistency as when received (in steel cans or drums) and not to thicken; also to be free from all harmful impurities. It does not contain either silica or asbestos.

No heating or cooking is required. The grain requires no heating either. Ready to use; no thinning necessary. Since the cut is faster, a finer grain size should be used than with glue.

Greater adhesive and cohesive powers are claimed; more flexibility; giving greater wheel life. It is said to finish (oiling in) as well as rough polishes because it is flexible; will bend instead of break.

Nuglu, it is stated, forms an insulation for the wheel, belt or disc and will stand 2000° of heat. Wheels can and should be force dried wherever possible. When the grain is worn from the wheel the size coat glazes and the material from which the wheel is made cannot be worn.

Do not throw any away at the end of the day as with glue. It is water soluble and the brushes used will wash in water easily.

Nuglu is recommended for all metals for saving: 1—glue pots; 2—heat to cook glue; 3—heat to heat grain; 4—less wheel setting up; 5—less abrasive bought; 6—less wheels; 7—less wheel racks.

Rust Solvent

Nielco Products Co., 5421-11 Cicotte Ave., Detroit, Mich., presents a product, a new and different type of rust solvent known as "Metal-Cleen". It is stated that all of the many different formulas are completely balanced. Some are designed to remove the worst degree of corrosion without any metal loss; others, to give from slight, medium to extreme etching, still giving the utmost corrosive solvent action. This variety of metal cleaners is based on a combination of active rust solvent acids called "Nielcacid". "Metal-Cleen" is composed of five series, each series representing a different acid combination. Each series has Seven Acid strengths and each acid strength has three solvent combinations.

In addition to their line of "Metal-Cleen" metal cleaners they have a Semi-Paste Rust Solvent for use on extremely corroded metal and particularly on vertical surfaces such as steel sash, bridges, towers, structural steel, tanks, equipment, etc. The Semi-Paste Rust Solvent is produced in three different grades.

All of the Metal-Cleen metal cleaners can be reduced with water 2 to 1, many of them 3 to 1, to give you the utmost in efficiency at the lowest possible cost.

Laboratory Thermometer

An entirely new type of laboratory thermometer, provided with a dial-and-pointer scale encased in stainless steel, mounted on top of an 8-inch stainless steel stem, is being introduced by the Weston Electrical Instrument Corporation, Newark, N. J.

The unit is said to be the first dial-type thermometer with an all-metal temperature element sufficiently accurate for scientific use. The pointer is actuated by means of an internally balanced double coil of thermostatic bimetal sealed in the lower 1-½ inches of the seamless stem. When the stem is immersed to a depth of 1-½ inches in a liquid (3 inches in gas or vapor), the dial reads temperature values accurately without the necessity for stem correction.

Accuracy of the unit is guaranteed to ½ of 1% over the entire scale. In practice, the location of the dial at the top of the stem, removed from the liquids or vapors under measurement, encourages a further increase in the accuracy with which readings are made. Dial markings are spaced for maximum readability on the metal scale plate, and are not subjected to obliteration from the solutions under test, as is the case with stem graduations. The low temperature values are not obscured in dark-colored or viscous solutions.

The stem of the unit which encloses the temperature element is ⅛-inch diameter high-strength seamless tubing of "18-8" chromium-nickel alloy steel. It is extremely rugged and completely corrosion-proof to all but a very few laboratory reagents. Construction of the temperature-sensitive coil is also inherently rugged and shock-proof. Reasonable overrange temperatures will not affect the accuracy of the unit.

Weston stainless steel laboratory thermometer

Initial models of the unit are being offered in the following scale ranges: 0-220 deg. F., 50-300 deg. F., 50-500 deg. F., 0-100 deg. C., 0-150 deg. C. Applications include temperature measurement in educational and industrial research laboratories, in control laboratories, hospitals and general scientific use.

Hard Soldering Flux

An improved, quick acting hard soldering and brazing flux, Kwikflux, has been recently developed and is now being marketed by Special Chemicals Corp., 30 Irving Place, New York City.

Because of its low melting point Kwikflux does not limit the speed of brazing and hard soldering operations, and allows the operator to perform his work as soon as the solder starts flowing.

The fluxing action of this flux begins at 212°F. It has a flowing point from 785°F. to 1600°F., and over. Because it does not evaporate at high temperatures, and has a low vapor tension, maintaining its volume at high temperatures, this flux can, it is stated, be used efficiently for high melting point solders.

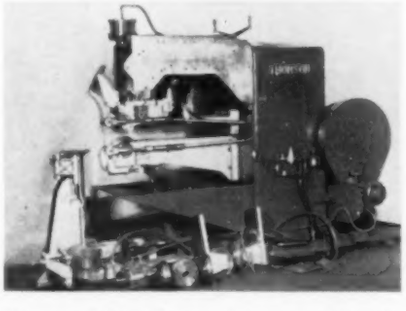
Kwikflux is for use in hard soldering, brazing, or welding of stainless steel, steel, iron, copper, brass, bronze, platinum, silver, monel metal, nickel silver and other metals and alloys, ferrous or non-ferrous, or any combination of these metals and alloys.

Its makers claim that Kwikflux cleans and floats away from the metal surface the oxides and other foreign matter present; acts as a solvent for the metal oxides formed by the action of the air; and covers the brightened metal surface to exclude air. The excess flux washes off easily from the finished work, leaving no residue, thus saving time, and cleaning expense.

Kwikflux has no adverse toxic action, and will not injure the workers' eyes, skin and respiratory mucous membranes, according to the manufacturers. The flux comes in the form of a paste which is to be mixed with water before using.

Universal Seam Welder

Two new machines designed to be all purpose welders for aluminum and similar alloys, have been developed by Thomson-Gibb Electric Welding Co., 164 Pleasant St., Lynn, Mass. These welders, it is stated, embody precision control features and also additional advantages in the way of broad flexibility and adaptability. They can accommodate work of various shapes and sizes and take a variety of electrode holders, most of which are arranged so that the points can be swiveled to almost any angle. The rocker arm is made of aluminum to reduce its moving weight and when additional clearance is required around the upper arm it is possible to remove the toggle mechanism and supporting members and actuate the rocker arm by means of a pressure cylinder which can be set up on a bracket at the back of the machine.



Thomson-Gibb Universal seam-welder for aluminum and similar alloys

The machine is set up for longitudinal seam welding, but by substituting an alternate head and lower arm it can be converted for circular seam welding. The heads can also be mounted in either a vertical position or at various angles on the finished surface at the side of the upper head. In this way the machine can be set up in short order to handle almost any special seam welding operation.

Buffing Composition Strength

It is the contention of the Bruce Products Corporation, 5712 Twelfth St., Detroit, Mich., that they have gone a long ways in the establishment of a definite scale for the measurement of the value of buffing compositions in the introduction of the Tri-Vac Buffing Compositions. These products are all produced under pressure. A definite scale of density has been established, and this scale is said to have a definite relationship to the adhesiveness, and therefore effectiveness, of the product in question. The resistance to fracture is greatly improved by the increased density. The buffing composition made by the old process, (pouring the melted material into a mould and cooling by air or water) they state, permitted the entire structure of the bar to take on a looseness closely resembling a honey-combed effect, which has been referred to by the superintendent of one of the large metal finishing establishments as "gravel compared to rock."

Tests were made of Tripoli and TRI-VAC to compare them as to density of structure and compressive strength. The tests and photographs were made under the personal supervision of Mr. DeGowin of the Detroit Testing Laboratory, 554 Bagley Avenue, Detroit, Michigan. The following figures show the results of the tests:

Density Measurements

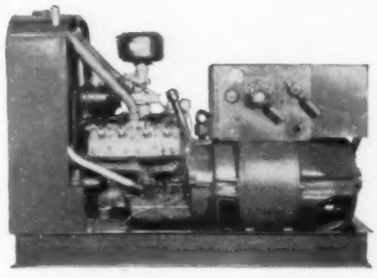
	Density in Grams per Cu. In.	Percentage of Improvement Over Old Compositions
Tripoli	26.9	
Tri-Vac	29.5	9%
White Finish	30.7	
Li-Vac	33.1	7%

Compression Tests

	Resistance to Fracture in Lbs. per Sq. In.	Percentage of Improvement Over Old Compositions
Tripoli	259.5	
Tri-Vac	343.0	32%
White Finish	933.5	
Li-Vac	1153.5	24%

Portable Welder, Gasoline-Engine Driven

A new, single-operator, portable welder, combining the improved Type WD-32B General Electric arc-welding generator and a standard 60-horsepower Ford V-8 engine, has been developed by the General Electric Company, Schenectady, N. Y., so that successful arc welding can be done independently of electric-power-line service. Designated as Type WD-32BY, the new welder has a NEMA rating of 200 amperes, 40 volt arc, 1 hour, 50 C, 60 to 200 amperes welding range. The complete unit, 24 inches wide, 60 inches long, and 43 inches high, can be loaded crosswise into practically any truck body. Net weight is approximately 1250 pounds.



General Electric portable welder

Features of the welder include self-excitation, duplex control, and self-stabilization. The heavy commutator on the generator furnishes reliable excitation without the use of any external exciter parts. Duplex control gives the choice of current and voltage adjustments that is essential to the best work under many varying conditions. The self-stabilization characteristic of the Type WD generator permits easy welding with any type of wire, either bare or shielded arc, and with any current or voltage adjustment.

Standard parts are used in both engine and generator, and ready accessibility makes maintenance easy. Ample power is provided by the engine even at the conservative operating speed of 1750 rpm—equivalent to a car speed of 31 miles per hour. Less than two gallons of fuel per hour will operate the machine at full load. Standard sets include electric self-starter, battery charging generator, oil-bath air cleaner, fuel pump, ten gallon fuel tank, and vacuum speed governor. Optional features available at additional cost include electric slow-down control, crank case oil filter, waterproof tarpaulin, auxiliary 1 or 2 kw 125 volt d-c generator, and a two-wheel pneumatic-tired, roller bearing running gear with trailer hitch.

A special design of coupling, particularly compact and durable, is used to connect the engine crankshaft to the generator. Torsional shock is decreased by this type of coupling and bearing strain is minimized.

Proportioning Indicating Controller

A device designed to proportion fuel input to demand, to control temperature and to indicate temperature is the proportioning indicating controller made by Wheelco Instruments Co., 1929-33 S. Halsted St., Chicago, Ill. It consists of an electrical device mounted integrally with indicating, controlling pyrometer and operates in conjunction with simple valves or contacting equipment. Where continuously variable input is required to maintain constant temperature to eliminate all overshooting or undershooting, the proportioning control is recommended. The input must obtain its control and vary as a function of the temperature.

Advantages given by the manufacturers for this instrument are the following:

Constant even temperatures.

No time lag due to slow furnace temperature changes or slow reaction of thermocouples mounted in protecting tubes.

Balance heat input against heat requirements.

Operating function is entirely electrical.

Performs functions which heretofore required complicated and expensive balancing equipment.

Wheelco "Proportioning Control"

Lacquer to Resist Rust Inhibitors

Lubricating oils containing rust-inhibiting substances are widely used in mechanical refrigerators, electric clocks, and other kinds of equipment. The rust inhibitors preserve steel surfaces from rusting and make possible the construction of apparatus that can be sealed and operated for years without attention. However, the chemicals used for this purpose create a finishing problem because they react actively with ordinary lacquers and discolor them badly.

To provide a clear lacquer that can be used on equipment lubricated with these oils, Maas & Waldstein Company, makers of industrial finishes, 438 Riverside Ave., Newark, N. J., has developed a special type. This new lacquer, it is stated, is not discolored or otherwise affected by any of the commonly used rust inhibitors, and it is also resistant to humidity, salt spray, 10% hydrochloric acid and other chemicals, as well as out-door exposure. It is tough, durable, and strongly adherent and will stand up well under stamping, forming, and other mechanical operations to make it especially suited for use on nameplates.

It is recommended for aluminum, brass, copper, and other metals by dipping and spraying. Air dries rapidly.

Automatic Machine for Fluxing

The Automatic Gasflux Company, Citizens Bldg., Cleveland, Ohio, is marketing a new machine that automatically dispenses brazing flux. The gas line runs through this machine, the Gasfluxer, and as the gas passes through, it is impregnated with a special flux. The flux then travels with the gas to the torch tip and is expelled in the flame. The special flux used is also a development of the above named company. It has a very low melting point and as a result, coupled with the fact that it is dispensed in a minimum quantity, the flux is said to creep ahead of and always be under the brazing puddle, penetrating quickly and thoroughly, preparing the metals so that an unusually tight joint is secured.

This process, by speeding up low temperature brazing, overcomes the factor of the heat entering the metal. Also it eliminates picking up too much flux or too little flux because of the automatic feature of the machine. No pickling is necessary to remove excess flux and very little grinding is needed. Obnoxious fumes sometimes present during the brazing operations, are not present.

This process is recommended for the joining of brass to steel, semi-steel, malleable iron, galvanized iron, nickel copper, Monel and other alloys. The savings claimed are higher speed, fewer rejects, less brazing metal used, less grinding and no pickling.

No special equipment is required as the machine can be used with all types of installations as well as in standard gas, torches, tips, regulators, etc.

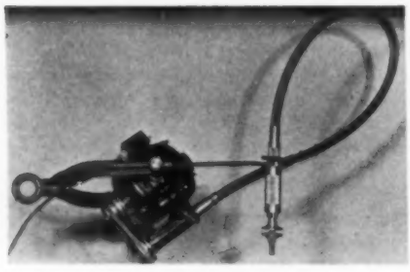
Gasfluxer for automatically dispensing brazing flux

Flexible Shaft Assemblies

Two new flexible shaft assemblies are offered by the Stow Manufacturing Co. Inc., Binghamton, N. Y., Assembly P and Assembly V.

Assembly P is of the three-speed bench type and may be used equally well mounted on a truck or on a wall in back of the bench. It is equipped with a Stow ball bearing counter shaft which is hinged and provided with a screw for belt adjustment. The unit is swiveled in both horizontal and vertical plane giving the flexible shaft greater freedom and making it possible to use it in any position without injury.

Assembly V is a three-speed unit designed for production in shops where floor space is at a premium. It may be mounted on a trolley or suspended from a hook. The machine is equipped with a ball bearing motor and a Stow ball bearing counter shaft which is provided with a screw for adjusting belt tension.



Stow flexible shaft Assembly V

Stow flexible shaft Assembly P

Contract Color Plating

As announced in our December issue, Philip Sievering, Inc., 199 Lafayette St., New York City, are now in full production in their new department devoted to "Electrocolor", the new method of producing colors on metals. This electrolytic process makes it possible to color metallic surfaces without the use of dyes or pigments giving them an inherent brilliance and metallic lustre or a soft egg-shell finish as desired. Almost innumerable color combinations can be obtained.

In the article describing this process, published in METAL INDUSTRY for October 1937, page 503-04, it is pointed out that the anode is pure metallic copper and the bath is made primarily of organic copper salts. The control of the bath is said to have been worked out so that it can be maintained reliably and economically. The color of the deposit is determined by the base metal itself together with the length of time that the article is treated in the bath. The colors are said to be light fast.

Among the applications for which this process is recommended are: novelties; clocks and jewelry; costume jewelry and ornaments; radio and indicator panels; building interiors (molding, strip, radiator covers, air conditioning unit, grilles, hardware, etc.); lighting fixtures; automobile hardware; automobile instrument panels; railroad: pullman and coach interior trim and hardware.

Match Plate Vibrator

"Something new in match plate air vibrators and vibrator hose" is the description applied to the Master Match Plate Vibrator by its manufacturers, the Kindt-Collins Co., 12697 Elmwood Ave., Cleveland, Ohio. The vibrator consists of an extra heavy steel body, bored, leaving only one open end, into which is inserted a special alloy bronze bushing. Into this bushing a rust-resisting, hardened and precision-ground piston is fitted. This piston, it is stated, makes it possible to utilize all of the air instead of wasting it through the conventional type of bleeder hole. Intake and exhaust ports are rectangular, instead of round, producing faster and more powerful vibration, due to more rapid exhaust and intake.

A heavy duty cadmium plated body end cap closes the vibrator. Twin exhaust holes on each end of the vibrator diffuse the air two ways and guard against sand getting into the vibrator. The entire body is cadmium plated to prevent rust.

The Master Vibrator Hose is of the hydraulic type. Machined steel fittings, cadmium plated, are rolled onto the hose to withstand 1400 pounds air pressure. The hose is built to withstand air pressure up to 1000 pounds and is not affected by grease or oil.

Kindt-Collins Master match plate vibrator

Metal Finish for Rubber

It is often desired to give the rubber parts or products a metallic finish that will harmonize with the metals with which they will be used. To make this possible, a special bronze lacquer for rubber has been developed by Maas & Waldstein Company, makers of industrial finishes, 438 Riverside Ave., Newark, New Jersey.

This special rubber lacquer is designed to make it possible to cover semi-stiff rubber with a strongly adherent, durable finish resembling brass, copper, bronze, aluminum, steel, or other metals. It consists of a special bronzing liquid to which metal powder of any kind is added just prior to use. The mixture is applied by spraying, and air-drys rapidly.

Nitrocellulose Lacquer Emulsions

A new development in nitrocellulose lacquers is the lacquer emulsion in water. So far this product has proved of most interest for coating porous materials, such as leather, paper, fabrics, etc., but it is advisable for manufacturers of metal products to watch this development, as it is in its early stages and the experimental work may lead it into new channels.

Nitrocellulose emulsions and the processes for making them are covered by patents or patents pending, owned and controlled by the Hercules Powder Co. Inc., Wilmington, Dela. The film-modifying ingredients may include plasticizers for making the film more flexible and softer; resins for making the film harder or with higher gloss; or pigments for imparting color to the film. The solvent is usually a mixture of one or more nitrocellulose solvents, such as esters or ketones and a hydrocarbon diluent, such as toluol. Alcohols are frequently added.

The fundamental purpose of lacquer emulsions in water is to coat a base with a durable, smooth, non-tacky finish, resistant to water, grease, oil, acids, alkalies and staining.

Heat Resisting Paint

The Lucifer heat resisting paint is made by K. Bader, Westmoreland Road, London, N. W. 9, England. This paint is made in two types: Type A for fire bricks, fire clay and cast iron; Type B for steel and other metals. It is not a decorative paint but intended essentially for the protection of the metal. It is recommended for Plumbago crucibles, exhaust manifolds of Diesel engines, furnace castings, etc.

Lucifer paint, it is stated, will resist temperatures of 3000°F. It can be sprayed, brushed or applied by dipping. One gallon will cover approximately 400 sq. ft. with one coat. It is available at this time in battleship grey.

Flock Spray Booth

Announcement has been made by The DeVilbiss Company, Toledo, O., of a new, improved spray booth, for use with flock, now included in the line of standard DeVilbiss exhaust equipment. These booths have been designed especially to meet the peculiar requirements encountered in the application of flock.

Ranging in size from three to ten feet frontal width, the booths are of the direct exhaust type. They permit the concentration of flock-spraying operations in one location, reclaiming sprayed material not applied to the articles coated, and preventing this light material from scattering throughout the finishing room.

The booths are equipped with a metal curtain on top and sides. An opening in the floor, directly in front of the screen and extending the entire width of the booth, allows for the collection of overspray in the recessed chamber beneath. All booths are provided with the required number of sprinkler openings.

A hinged door at each end provides access to inside of collection chamber, and allows easy removal of accumulated material. Removable, reinforced cheese cloth screens at rear of booths collect the flock, and prevent it from passing out the exhaust pipe.

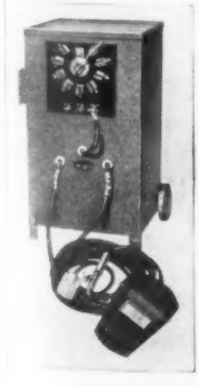
All booths are equipped with standard DeVilbiss exhaust fans. Motors recommended for these fans have additional power to provide for efficient exhaust when the screen becomes loaded with flock.

DeVilbiss spray booth for flock

Three, four, five and six foot booths are leg type. They are of strongly welded unit construction, similar to standard DeVilbiss paint spray booths. Eight and ten foot booths are floor type, and may be obtained with metal floor if floor of of finishing room is such that this is desirable.

Portable A. C. Welder

Designed exclusively for heavy service in the average industrial plant, Giant Grip Mfg. Co., Oshkosh, Wisconsin, announces a new portable A. C. Welder. Illustrated here, it is known as "Industrial" model and has a current range from 10 amperes to maximum output, with open circuit arc in three voltages, 80, 85, and 90, but higher voltage can be supplied if desired. The voltage changes are easily accomplished by changing the leads in the box mounted on the side of the cabinet. The transformer coils are so constructed to permit maximum cooling with elimination of "hot spots" in the center of the coils, and has forced air circulation to provide ample circulation of air. The knife switch control is placed on the front of the cabinet. This welder has reactance control and static high frequency current and other features of construction as assurance that it will not overheat nor burn out under continuous service. It is made in four models, from 300 to 600 amperage, and weight from 425 to 850 pounds for the largest model.



Giant Grip portable A. C. Welder

Metallic Lead Coating

The resistance of metallic lead to corrosion has long been recognized but the price and the difficulty of application have retarded its use to some extent. These objectionable features are said to be entirely eliminated by Denso-Metleaf, a pure metallic lead finely leafed, reduced to a paste and mixed with the Densol vehicles which are especially formulated to meet corrosive conditions. This material is the product of the Densol Paint Co., Box 35, South Park, Ohio. The Densol company recommends it for application to metal, wood, concrete, plywood, masonite or other similar composition wall boards, etc., stating that it will adhere to galvanized iron without preparing the surface with an acid treatment or awaiting weathering. It can be applied with the brush or spray gun, dries quickly to a smooth sheet of metallic lead which it is claimed, resists shock and will not flake or blister even under wide ranges of temperature.

Other products of the Densol company are: Denso-Metleaf Thirty-Nine, a combination of metal lead leaf and the vehicle of Densolume, an extra brilliant aluminum enamel; Densol-Forty-A-Metleaf, a rubber base acid and alkali resisting finish; Densol-Forty-D Metleaf, a combination of the vehicle Forty-A and metallic lead leaf; Densoplio Metleaf, an adaptation of Pliolite, a rubber hydrocarbon derived from crepe rubber; Densochlor Metleaf, a chlorinated rubber finish using Densochlor metallic lead.

Bonded Metal and Wood

A new product that is designed to combine the strength of steel with the beauty of wood is Robertson Bonded Metal, made by H. H. Robertson Co., Grant Bldg., Pittsburgh, Pa. It consists of a base of sheet steel to which a fibrous material is bonded by means of a soft metal, of low melting point, and the application of heat and pressure. Little "teeth" of the soft metal lock the fibrous material to the steel. Over this, to one or both sides, is applied wood veneer, by means of a phenolic resin adhesive. "Teeth" of this adhesive interlock with the metal "teeth."

The resultant product is said to be entirely integral and may be stamped, spot-welded, cut with the usual metal-cutting tools and even subjected to other forming operations. After the wood veneer has been applied, Robertson Bonded Metal can, it is claimed, be bent and formed to an unusual extent. If bent with the grain, a complete circle may be formed against the grain, enough to form rounded corners. It is adaptable to intricate inlays of contrasting or matching woods, and harmonizes with standard mouldings and fastenings.

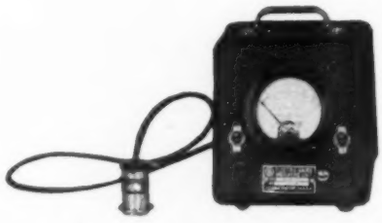
Robertson Bonded Metal, it is stated, will not shrink or crack; minimizes fire and moisture hazards; is non-metallic in sound and touch and minimizes air-borne noise. It is recommended for paneling, furniture, cabinets, table tops, novelties and hundreds of other uses. It is available in thirty different wood veneer finishes; in sheets up to 36 inches wide and 8 feet long, and with steel core sheets in gauges from 30 to 18, inclusive.

Room paneled with Robertson Bonded Metal

Electric Gauge for Thickness of Coatings

An electric gauge for measuring the thickness of non-magnetic coatings, protective or decorative, on a steel base is a product of the General Electric Co., Schenectady, N. Y. This gauge is fundamentally a device by which an electric current is controlled or modulated according to the relative position of one of its parts with respect to iron or steel. It has been found useful for measuring the thickness of paint, enamel and plating over flat steel surfaces, as described in a paper, "The Electric Gage" by C. M. Hathaway and E. S. Lee, in Mechanical Engineering for September 1937.

A coil within an iron shell approximately 1 inch in diameter is placed on the surface of the article to be tested, the paint or enamel forming an air gap between the pole tips and steel backing. This coil is connected to one arm of the bridge and a fixed balancing coil to the other. Variations in the paint thickness cause variations in impedance of the gauge coil so that the indicating instrument can be calibrated in terms of paint thickness. This type gauge is especially recommended for measuring the thickness of enamel or paint coatings.



G. E. Enamel Thickness Gauge

Another type of electric gauge is the eddy-current gauge which is used for continuous measurement of aluminum foil during rolling without coming in contact with the foil. The foil is passed through a gap ⅜" wide in the gauge head. The indicating instrument is calibrated with zero at the center of the scale so that, with foil of correct thickness in the gap, the pointer remains on zero. A variation of thickness of 0.0001" thickness will cause the pointer to move to the right or the left depending upon whether the foil is too thick or too thin. The instrument can be set at zero for any nominal thickness of foil within the range of the gauge.

Corrosion Proof Tanks

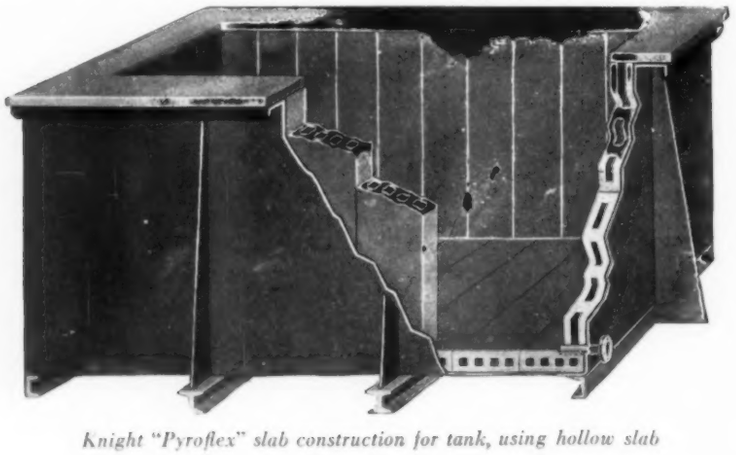
Maurice A. Knight, Kelly Ave., Akron, Ohio, with New York offices at 55 W. 42nd Street, announces a line of Pyroflex and Knight-Ware Slab Construction for corrosion and leak proof tanks and towers, suitable for pickling, metal cleaning, chrome and nickel plating, acid treating, etc.

The Pyroflex slab construction provides, it is claimed, an acid and leak proof tank lining of the highest quality at low cost combining strength of structural steel with the positive protection of acid proof materials.

Pyroflex is a non-porous, non-aging seamless lining that seals the shell against corrosion and provides an expansion cushion and insulation for the Knight-Ware slab.

Pyro-Slab steel tanks can be furnished complete or can be installed in suitably prepared steel or concrete shells in the user's plant.

The hollow slab shown in the illustration is used chiefly where heat insulation or a lighter floor load is desirable. Solid slab, 2" thick is used alone for chrome plating tanks and the solid slab with Pyroflex is used for general chemical processing tanks.



Knight "Pyroflex" slab construction for tank, using hollow slab

Cosmetics for Workers

A new type of protective treatment for the hands of industrial workers is being marketed by the Davis Emergency Equipment Co., 55 Vandam St., New York.

The treatment consists in the use of two different creams (known as No. 1 and No. 2 Eco Protective Creams—Davis) one for protecting the hands during work and the other for use after work.

The No. 1 cream is rubbed into the hands, and on the arms, if necessary, before starting work. It forms an invisible, non-sticky, unnoticeable film which protects the skin from the action of chemicals, solvents, grease, oil, gasoline, and other substances harmful to the skin. When the hands are washed at noontime and night, the film comes off easily, bringing with it all the dirt, grease, paint, lacquer, etc., that the hands have picked up, and leaving them smooth and clean without the use of abrasives.

The No. 2 cream is applied after finishing work for the day. It replaces the natural oils of the skin with a soothing cream which keeps the hands soft and free from chapping and cracking. This cream is also used by those whose hands are constantly wet with water, since the No. 1 cream is not suited to provide protection against the effects of water and aqueous solutions.

Both types of cream are supplied in 16 oz. cans.

Buffing Compositions

Recently announced by Frederic B. Stevens, Inc., of Detroit, Michigan, are three new nickel buffing compositions. They are designated as:

No. 601 *Hi-Luster* (White) An extra dry grade for producing the finest finish on such work as small die-cast parts and for a final wiping operation.

No. 602 *Hi-Luster* (Pink) A medium dry grade that contains a percentage of the finest quality rouge.

No. 650 *Fast Finish* (White) Another medium dry grade that is fast cutting. This grade is especially recommended for buffing operations on hard, dense deposits and for coloring copper, brass, etc.

Drawing heavily on the research facilities of the laboratory and combining that knowledge with the experience gained in manufacturing buffing compositions for over forty years, a new formula was discovered and a new method of making nickel buffing compositions was conceived and developed to a point of high efficiency.

These nickel buffing compositions are based on a new formula developed by the combination of research work in the laboratory and forty years experience in manufacturing buffing compositions. They are said to have proved under operating conditions, to produce a clearer, more lustrous, more beautiful finish.

A previous practice of buffers that has been rather diligently followed in the past, has been to apply the buffing composition rather heavily to the wheel. This practice which is wasteful, it is stated, is not necessary with these new compositions as they take to the wheel quickly and easily and bring up a high luster finish just as quickly and easily.

Another important claim is the uniformity of each cake, of each grade, and every shipment. Although a new method of manufacturing is employed, the uniformity of these new nickel buffing compositions is guaranteed by strict control in the laboratory and in the manufacturing process.

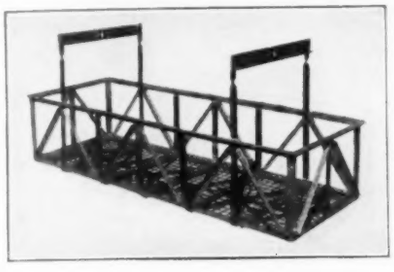
Arc Welded Dipping Baskets and Pickling Crates

Rolock Inc., 19 Station Street, Southport, Connecticut is announcing the development of arc welded industrial baskets and crates.

There are many significant advantages for the user of baskets in the arc welded construction as compared with former assembly practice. The mesh at the top is smoothly welded into the frame, doing away with any possibility of wires pulling loose and scratching either the work or the hands of the workman. Side and bottom seams are strongly welded with no overlapping or crevices to catch the work. The mesh is adequately braced to take the wear on the frame.

Rolock arc welded crates are designed for maximum strength with minimum weight. All joints are sealed by welding on all sides, leaving no pockets to hold corrosive acids.

Rolock arc welded baskets and crates are furnished in a wide variety of designs in nickel chrome, stainless steel, Monel metal and plain steel.



Rolock arc welded crate

Rolock arc welded wire basket

Industrial Finish

A new industrial finish said to attain the production speed of lacquers and possess the desirable qualities of permanence and durability common to synthetic resin finishes is announced this month by Ault & Wiborg Corporation, 75 Varick St., New York City.

This new product, called Polymerin, is the result of a distinctive formulation. Its action is due to the principle of polymerization, a chemical reaction whereby molecules combine under suitable conditions to form molecules of more complex and stable structure. It does not dry by oxidation. Oven temperatures and the mass of metal determine the processing time, which varies between a few minutes and a few seconds. Only one bake is required.

Polymerin provides a suitable finish for washing machines, office equipment, metal furniture, toys, stoves, hospital equipment, plant machinery, electrical appliances, and other types of metal products.

According to J. R. Esposito, president of Ault & Wiborg, Polymerin handles in much the same manner as other finishing materials. It sprays freely, or it may be dipped.

Tests at the Research Laboratories of Interchemical Corporation show Polymerin to be resistant to all common deteriorants. Its characteristics of flexibility and adhesion are reported to be equal to those of any synthetic resin finish.

The finish comes in any color and in any degree of gloss or dullness. Available in a clean white permanent to sunlight, Polymerin is well adapted for products like washing machines and hospital and laboratory equipment which are also subjected to alkalies, acids, and other discoloring agents. In many applications, Polymerin adheres to bare metal without undercoating.

It "sets-up" so rapidly that a dust-free surface materializes quickly. It will not collect dust or foreign particles floating in the air either before or during polymerization.

A report on Polymerin has been issued by Ault & Wiborg and copies may be obtained by writing to that company at 75 Varick Street, New York City.

Sparking of Beryllium Copper

A notice from the Riverside Metal Company, Burlington County, Riverside, N. J., reads as follows:

"Recent investigations tend to disprove the statement previously made to this company that beryllium copper is absolutely non-sparking, and on the faith of which certain statements were made in this booklet on Beryllium Copper.

"It now appears that, under certain conditions, the use of beryllium copper does not insure freedom from sparking."

The Riverside Metal Company has, therefore, sent out stickers with a correction, especially to the first paragraph on page 10 and the last paragraph of page 5 of the revised edition of their booklet Riverside Beryllium Copper dated May 1937.

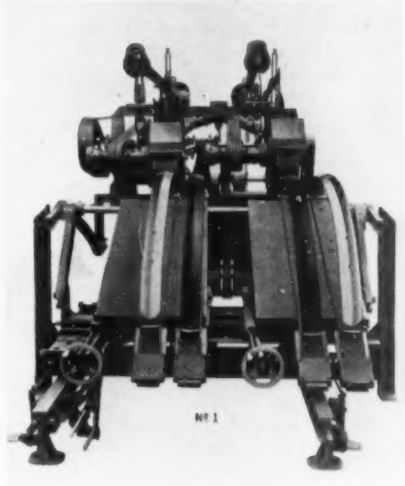
New Zinc Discovery in New Jersey

According to a report in the daily press, the seven Hewitt brothers of Paterson, N. J., have discovered a vein of zinc in the Old Indian Mine, Sparta, N. J. The vein is said to be increasing in size as the work progresses. The strike is only eight miles from the famous Franklin mines.

Automatic Automobile Bumper Polishing Machine

A new automatic machine for polishing automobile bumpers designated as No. 27-B-R, has been placed on the market by the Excelsior Tool and Machine Company, Ridge Avenue and 30th Street, East St. Louis, Ill. Any design, shape or camber bumper that can be polished in production automatically can be finished on this machine, front view of which is shown below. The bumpers are always in plain sight of the operator for inspection, from the roughing to the finishing operation. The equalized polishing wheel pressure over the full length of the bumper prevents undue wear, and prolongs the life of the polishing wheels. Only the extreme ends are hand-finished.

The cams are adjustable to accommodate different types of bumpers. The operation is continuous, two bumpers being polished at the same time, and when the desired finish is obtained, the carriage is shifted at the extreme front travel to the next bumper. The finished bumper is removed and replaced when the carriage is in the forward location.



Excelsior automatic bumper polishing machine

Among the advantages set forth are: universal application; elimination of skilled polishers; continuous operation; high production and low cost; uniform finish; rocking tables to increase wheel life; wheel pressure equalized; only one operator for 2 bumpers at a time; adjustable holding fixtures readily changed to suit bumpers.

All-Glass Filter Bag for Anodes

Munning & Munning Inc., 202-208 Emmett St., Newark, N. J. have recently introduced to the trade a new anode filter bag made entirely from finely spun glass cloth.

The fabric has a coarse square weave which will retain finely divided particles and still give the advantage of high porosity. In addition to the fact that the fabric iself is 100% woven glass, the anode bags are double-lap-seamed lengthwise and securely sewed on the bottom with glass thread throughout, so that only one material, and that is glass, enters into their construction.

The advantages given for this new type of anode filter bag are: prevents insolubles from entering the plating solution; the glass filter bag can be used repeatedly; can be used in either acid or alkaline solutions, within the temperature range of any plating solution, and is as resistant as chemical glass to attack from all chemicals with the exception of hydrofluoric acid and concentrated caustic soda.

The glass bags are, moreover, said to be considerably stronger than any of the common variety of cloths now used in filter bags because they are woven from staple length, strong and pliant individual fibres which does not deteriorate on wetting, because it does not swell and because the weave of the fibre does not open up.

Munning & Munning all-glass filter bag for anodes

Three-Dip Degreaser

For those departments where economical, efficient cleaning processes are desired, the Detroit Rex Products Company, 13005 Hillview Avenue, Detroit, Michigan, offers a three-dip, hand-operated Detrex degreaser.

As can be seen from the cut-away illustration, the machine consists essentially of three chambers separated by wide dams which act as heat insulators. The chambers, from left to right, are designated as the boiling chamber, the rinse chamber, the vapor chamber.

The arrangement of the three chambers permits a straight line sequence of cleaning operations. The work, which is placed in large perforated baskets, can be handled by hand or by means of a hoist, depending upon the weight of the load. The baskets, containing the work to be cleaned, are lowered into the boiling solvent in the first chamber where the heavy contamination is removed. The continuous sweep of the boiling solvent over the work gives a washing or scrubbing effect that assists in the removal of solid particles and caked-on materials. After immersion in the first chamber, the work is placed in the second or rinse chamber. The temperature of the solvent in this chamber is lower than that of the boiling chamber and that of the vapor chamber—the temperature difference being maintained by the open air space in the dam separating the chambers. Immersing the work in the cool rinse lowers its temperature and, at the same time, flushes off the work. A final cleaning, reheating, and drying are effected by placing the work in the third or vapor chamber. The work emerges from this chamber clean, warm, and dry—ready for subsequent operations. The entire cleaning cycle requires but a few minutes time at the most.

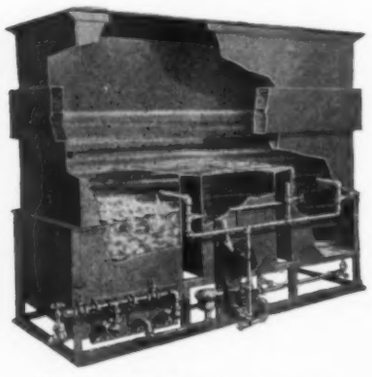
The water jacket and solvent collecting trough, which can be seen in the illustration, completely encircle the machine. The vapors, which condense at the level of the water jacket, are collected in the trough and returned to the rinse chamber. This arrangement insures a continuous supply of clean solvent condensate for rinsing the work.

The machine is equipped with a vapor actuated, air-operated control system, consisting of thermostat temperature indicator and valve, which is used to regulate the heat input, control the height of the vapor column, and insure maximum operating economy.

In order to maintain constant solvent levels in the various chambers, a motor-driven solvent transfer pump is used to return the overflow to the boiling chamber. This pump is also used for the transfer of solvent from any one chamber to any other chamber when cleaning the machine or distilling the solvent. It may also be used when filling the machine with solvent.

While the unit shown is arranged for steam heating of the solvent, models are available which employ gas or electric immersion heaters as the heating medium.

Overall dimensions of this unit are: 7′ 1″ long, 3′ 6″ wide, and 5′ 6″ high. The solvent capacity is 123 gal.



Detroit Rex three-dip degreaser

Protection Against Chemical Corrosion

Sarva is the trade name of a new interior paint made by the American Asphalt Paint Co., 43 E. Ohio St., Chicago, Ill., to protect surfaces from chemical corrosion and fumes. It is recommended for plants using sulphuric acid and others; can be used to protect pipe lines, acid bath containers, wood and metal tanks, etc. The manufacturers state that it also serves as water-proofing while protecting the surface from rust and the destructive action of chemicals, (even chlorine). Sarva, it is stated, has no odor or taste and will not discolor water. It can be applied with an ordinary paint brush or a spray gun.

Sarva acid resisting paint is made of 99.5% pure Gilsonite natural asphalt with special acid resisting resins and oils. Available in red or black. Sarva Liquid is said to dry with a high gloss; Sarva Compound has a semi-gloss finish. Both products require approximately 12 hours drying time.

Overhanging Spindle Grinder

The Hammond Machinery Builders, Kalamazoo, Mich., announce a new addition to their grinder line. It will be known as the model "WRO" overhanging spindle grinder and which is especially desirable for large bulky work where extra space around the wheel is at a premium.

The top section overhangs 12¼″ from the lower front of the base; distance between wheels is 40⅜″; spindle is 52″ long overall; Grinder is equipped with 14″ diameter guards and standard equipment includes push button control with automatic motor starter having thermal overload protection. Motor up to 7½ H.P. can be fitted inside the base and the net weight of the machine is 1200 lbs.

Although the grinder is shown without work rests and which usually are not wanted with large bulky work, work rests may be had if desired.

Hammond WRO overhanging spindle grinder

Bright Copper Solution

A bright copper solution has been perfected, according to an announcement by the Zialite Corporation, 10 N. Bleecker St., Mt. Vernon, N. Y. The work emerges from the tank with a very brilliant finish, making polishing unnecessary. Among the advantages pointed out are: saving in buffing labor; the work can be placed immediately in the bright nickel or the chromium tank without polishing; the copper plate can be easily given oxidized finishes; solution is non-poisonous; no gassing during operations.

The Zialite bright copper solution has been in successful commercial operation for several months.

Protective Helmet Approved

W. W. Sly Manufacturing Co., 4700 Train Ave., Cleveland, Ohio, reports the official approval of the Sly Purair helmet by the U. S. Bureau of Mines, as an approved and dependable safeguard against inhalation of injurious dust. Bulletins S 88 and S 81 give detailed information on the construction and operation of this helmet.

Tinning Flux

"Blitzstone" a new tinning flux is announced by the American Solder & Flux Co., Wayne Ave. & Berkley St., Philadelphia, Pa. This product is available in liquid form, the solution having a gravity of approximately 50° Baume. In this form it can be used both as a dipping flux and as a top cover for the surface of the tin bath. It is recommended for use in the sheet mills, for the tinning of industrial products such as castings, or retinning, etc.

Among the advantages given for this material are brighter, smoother and more uniform surfaces; elimination of costly redipping operations; proper blending and careful balancing of the ingredients resulting in a more active and efficient fluxing material.

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Three LEADERS in the Buffing and Polishing Industry for 1938

Regular Type

Specially Formed

Outlasts the ordinary buff two to one.

Retains its cutting surface right down to the core.

Cloth is cut and formed so that it cannot ravel and every thread is in constant contact with the work all around the periphery of the wheel.

Type "K"

Overlap Ply

Face of this buff is a little harder than either of the other two shown here.

Ideal for heavy work. Does any job quickly—thoroughly—and at a saving of composition and labor. Operator uses less pressure, works faster, easier.

Type "A"

Overlap Ply

Note overlapping of ply—extra cutting face—more polishing surface—5 sections equal 10 of ordinary buff.

Compound retained in loops formed by the overlap—lasts and does more work. Great for cutting down heavy parts.

Try out these buffs in your plant. See their efficiency by actual tests on your work

BIAS BUFF & WHEEL COMPANY, INC.

430 Communipaw Ave., Jersey City, N. J.

Watch for the Coming Issues of Metal Industry!

This—the January 1938 Annual Review and Preview Number—is one of our outstanding issues. But we have no intention of letting February drop back. On the contrary, for our coming issues, we have ready some of the best articles that we have ever published—technical and practical. Note the following:

The Resistance Welding of Aluminum, by G. O. Hoglund, Welding Development Engineer, Aluminum Co. of America.

Fabricating Properties of Nickel Silver as Affected by its Chemical Composition, by Dr. B. Egeberg and N. E. Promisel, International Silver Co., Meriden, Conn.

Control of Electroplating Processes, by S. C. Taormina, Technical Director, Industrial Research Corp., Brooklyn, N. Y.

The Electrodeposition of Copper on Aluminum Previously Oxidized by Chemical Means. An extended abstract by Walter R. Meyer, Chemist, General Electric Co., Bridgeport, Conn., of a German article.

Buffing Without Leaving Marks, by H. Moore, Brass Polisher.

Wastes in Metal Finishing Operations, by Philip J. Lo Presti, Electroplating Chemist.

The Cost and Control of Polishing Supplies. How obtained and used for estimating and cost finding in the metal products manufacturing industry. By Chas. W. Hardy, Industrial Consultant.

Zipper Fasteners Plated Automatically, by Wesley F. Hall, Chief Designing Engineer, Hanson-Van Winkle-Munning Co., Matawan, N. J.

Manufacturing High Grade Brass and Bronze Valves and Fittings, by C. L. Erickson, Works Manager, Walworth Company, Boston, Mass., as told to F. A. Westbrook, Mechanical Engineer.

A Study of the Rochelle Salt Copper Plating Bath. Part 4 of this important series by Dr. A. Kenneth Graham and Harold J. Read.

Watch for the Coming Issues of Metal Industry!

Lively Discussion over Cleaning Costs
—and the unanimous decision!

As usual, at the beginning of the year, the Board of Directors have met. The President and other officers make their reports. A sizable dividend was expected, but what a surprise, as things do not look so "rosy."

One live-wire director asks why manufacturing costs are so far out of proportion to net profits. Another asks if a recent cost analysis has been made. At this point the head bookkeeper submits the cost sheets. Everybody is keyed up!

These sheets show the cost for cleaning to be prohibitive. Further study indicates that the process employed hinders production, and the percentage of rejects is too high. The evidence strongly points to the use of a faulty cleaning compound.

So it was decided to call a Magnuson expert on Cleaning Compounds and get this important item on a money saving basis, for it affected the entire output and cut heavily into profits.

PERMAG CLEANER LEAD

Metal Fabricators, or any concern whose 1937 dividends are small might well look to the CLEANING COMPOUND feature. The Magnuson Products Corporation are equipped to go into this problem and work out a complete solution. Call on us.

PERMAG CLEANER LEAD

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Canada Headquarters: CANADA PERMAG PRODUCTS Ltd., Ottawa & Queen Sts., Montreal, P. Q. Cable Address, PERMAG, N. Y.

New Books

The Retardation of Chemical Reactions, by Kenneth C. Bailey. Published by Longmans, Green & Co. Size 6 x 9, 479 pages. Price $8.00.

This is a fundamental work on retardation (or inhibition) of chemical reactions, such as oxidation, corrosion, etc Numerous types of retardation are included, intensive drying, the use of solid catalysts, the small retardation produced by "salt effects", etc. The field is so large, however, that there is no lack of material; oxidation alone provides enough for volumes.

Sections of special interest to metallurgists are of course those devoted to the retardation of metallic corrosion and reactions involving sulphuric acid.

Effect of Impurities in Copper, by S. L. Archbutt and W. E. Prytherch. (*Research Monograph No.* 4 of the British Non-Ferrous Metals Research Association). 134 pp. Published by the Association, Regnart Buildings, Euston Street, London, N.W.I. 1937. 12s. 6d. (Postage 6d.).

In recent years the British Non-Ferrous Metals Research Association has published three Research Monographs, dealing respectively with "Tin Solders" (No. 1), "Metallurgical Analysis by the Spectrograph" (No. 2) and "The Casting of Brass Ingots" (No. 3). These are now followed by a fourth, "Effect of Impurities in Copper".

The book opens with an account of the scope of the investigation and of the methods of preparation and testing of the materials used, followed by a short chapter on commercially pure copper. The bulk of the book gives a detailed discussion of the effects of various impurities, including Oxygen, Oxygen plus Hydrogen, Sulphur, Iron, Phosphorus, Silicon, Bismuth, Lead; Arsenic, Antimony, Nickel and Silver, individually and in various combinations; the combined effect of Nickel, Antimony and Oxygen; and of Bismuth, Arsenic, Antimony, Nickel and Oxygen, two or more together. Examination was made by tensile, impact, hardness, fatigue and bend tests on the mechanical side, and on the physical side by density and electrical conductivity measurements. Finally, after a discussion of the segregation of impurities, the authors give a chapter in which the comparative effects of the various impurities are summarized.

The value of the book is enhanced by the numerous tables provided, in which results obtained in all the tests of the various materials examined are set out in detail: these tables are a mine of practical information. There are numerous photomicrographs and other illustrations. Literature references are provided at the end of each chapter, and the book is rounded off by an index which has been arranged so that the effects of any given impurity or group of impurities can be found very readily.

Symposium on Wear of Metals, published by the American Society for Testing Materials. Size 6 x 9; 105 pages; paper bound. Price $1.25.

The six technical papers comprising the symposium were presented at a meeting of the Society in Philadelphia in April, 1937.

Subjects covered include: considerations involved in the wear testing of metals (this paper includes definitions of wear and has a bibliography of 137 important references); wear of metals from the automotive viewpoint. An important paper covers wear from the power equipment viewpoint and there is also a comprehensive paper dealing with the wear of metals in the textile industry. Finally, a short paper discusses wear of metals from the railroad viewpoint. Discussion of the papers is included.

Modern Refractory Practice—Second Edition. Published by Harbison-Walker Refractories Company, Pittsburgh, Pa., 1937. 296 pages, 52 illustrations, 97 charts and tables, index. Price $2.50; for students and college use, $1.25; to users of refractories, free.

Covering every phase of the subject of industrial furnace refractories, this publication is actually a practical service handbook, an up-to-date technical review, and a complete catalog combined in a single volume.

Sixteen full-page furnace drawings have been prepared on the basis of current industrial practice in cooperation with engineers specializing in furnace design. These drawings show in detail the standard types of refractories used at every point, as well as alternate types used to meet special conditions of operation. A discussion of the particular problems encountered in the use of refractories in each type of furnace is also included.

In recent years a number of new types and classes of refractories have been introduced; and the list of standard and special sizes available in the various types and classes has been considerably expanded. A complete review of all available sizes and shapes, illus-

trated by dimensional sketches, is a valuable feature of the volume.

Metallurgical Abstracts (General and Non-Ferrous). Volume 3 (Series II.), size 5½" x 8½". 1936. pp. I-VIII+897. Cloth. Edited by G. Shaw Scott, London: The Institute of Metals, 36 Victoria Street, Westminster, S.W.1. (Subscription price £4 inclusive of two "Proceedings" volumes).

The Institute of Metals has issued the third volume of its invaluable *Metallurgical Abstracts*. The book is even larger than its bulky predecessor. In this growth is a reflection of the ever-increasing volume of metallurgical work that is being published all over the world. The present volume contains upwards of 10,000 abstracts.

The field covered includes properties of metals and alloys, metallography and crystal structure, corrosion and protection, electrodeposition, electrometallurgy, refining, analysis, laboratory apparatus and instruments, testing, temperature measurement and control, foundry practice and appliances, scrap metals, furnaces and fuels, refractories, heat-treatment, working, joining and the cleaning and finishing of metals.

Chemical Engineering Catalog, published by Reinhold Publishing Corp., New York. Size 8 x 11; 1034 pages. Price $10. Free to industrial users of chemicals.

This standard annual catalog is now in its 22nd edition. It comprises data on equipment, machinery, laboratory supplies, heavy and fine chemicals and raw materials used in the industries employing chemical processes and manufacturing; also a scientific-technical book section giving a practical complete list of books in English on chemical and related subjects.

Bearing Metals and Alloys, by Henry Norman Bassett. Published by Edward Arnold & Co., London, England. American agents, Longmans, Green & Co., New York. Size 5½ x 8½, 428 pages. Price $8.50.

Although bearings might be called one of the minor points in engineering, there is no single point, minor or major, which is more critical; nor is there any field in which changes have been greater, because of the enormous strides made in the development of new alloys and combinations of metals, many of which have been found suitable for bearings.

The author first describes bearing metals in general giving their crystal structures, theories, etc.; discusses the lubrication of bearings, and then goes into detail about bearings made from various metal bases including lead, tin, copper, zinc, cadmium, aluminum and magnesium.

The book is intended primarily for the works manager and designer rather than the research worker, but it will be useful to the latter also, as a good survey of the literatures on the subject.

Protective Films on Metals, by Dr. Ernest S. Hedges. Published by D. Van Nostrand Co., Inc., New York. Size 6 x 9, 276 pages. Price $5.00.

This standard work is now in its second edition. It gives a clear comprehensive account of corrosion beginning with an explanation of the mechanism, treating of the effects of oxygen on metals and bringing up to date data on the use of protective films. It has been written not only for the highly technical man but also for those who, while not actually engaged in research, wish to keep abreast of progress in this field. Consequently the author gives details about special methods of corrosion prevention including hot-dipping, electroplating, Parkerizing, Sherardizing, etc.

The chapter headings, some of which are given below, make the scope of the book clear.

The Mechanism of Corrosion; Protective Effect of Oxygen on Metals; Protective Films Formed During Atmospheric Corrosion; Protective Films Formed in Liquid Media; Anodic Films; Coating by Hot-Dipping; Electroplating; Sprayed Metal Films; Paints, Lacquers, Enamels, etc.

Glossary of Paint, Varnish, Lacquer and Allied Terms, by Ray C. Martin. Published by the American Paint Journal Company. Size 6 x 9, paper bound, 92 pages. Price 50 cents or $1.00 depending upon quantity.

Mr. Martin is a well known technologist in the metal coating industry and is actively engaged in that field. It is the most complete work to date giving definitions of paint, varnish, lacquer and allied terms. Excluded purposely are brand names used in the industry, as a list of more than 23,000 of these already have been compiled and published by the Trade-Mark Bureau of the National Paint, Varnish and Lacquer Association.

An extremely useful reference work.

Fourth Annual Report to the Industry of the Refrigeration and Air Conditioning Institute, Inc., 2130 Lawrence Ave., Chicago, Ill. The aims, purposes and activities of the Institute, details of a nation-wide training program which it is conducting and the extent to which this program has been accepted by leading manufacturers and others in the industry.

The Institute represents an outstanding development of facilities and methods for serving an industry through the medium of

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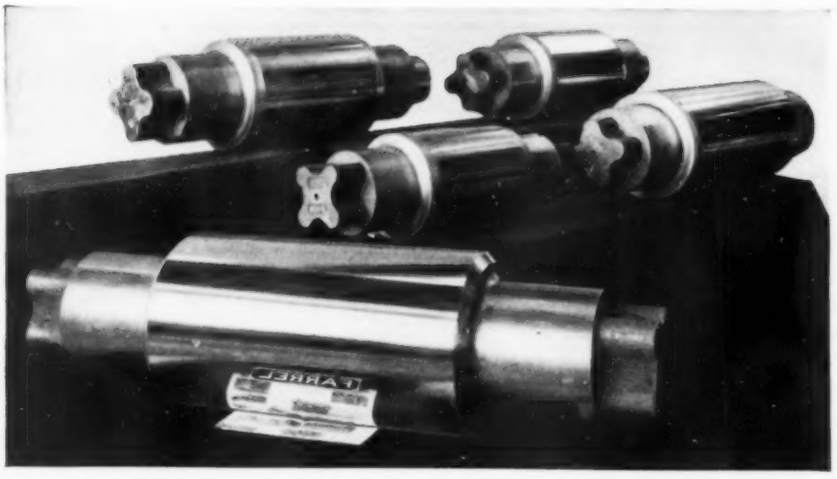

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Farrel-Birmingham Rolling Mill Equipment includes: Rolls—Rolling Mills—Rod Mill Tables and Manipulating Equipment—Universal Mill Spindles—Rod Coilers—Lead Presses for Pipe or Rod—Roll Grinding Machines—Roll Calipers—Gears—Mill Pinions—Pinion Stands—Drives up to 10,000 H.P.—Flexible Couplings.

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industrial training and supplying the new type of craftsmen which the industry needs.

Principles of Powder Metallurgy, by W. D. Jones, published by Longmans, Green & Co. Size 5½ x 8½, 999 pages. Price $5.00.

This book is the first to appear on a subject which has interested the industrial and technical world for several years. Powder metallurgy has developed an important significance in the metallurgical and manufacturing world. The author is a lecturer in metallurgy at the Sir John Cass Technical Institute in England.

The book is confined to the use of metal powders for forming solid articles by means of pressure and heat. No other uses of metal powders (such as for example in the manufacture of pigments) have been considered.

The contents include the following subjects: Principles of Sintering; Physical Properties of Sintered Metal Compacts; Industrial Applications (platinum, iron, nickel, bronzes, chromium, tungsten, etc.); Manufacture of Hard Metal Alloys by Sintering; Manufacture, Properties and Testing of Metal Powders. The book is a welcome addition to metallurgical literature.

Manual of A.S.T.M. Standards on Refractory Materials. Published by American Society for Testing Materials. 6 x 9, paper bound, 180 pages, price $1.25, with special prices on orders for 10 or more copies.

The 1937 Manual of A.S.T.M. Standards on Refractory Materials gives in their latest form all of the specifications, test methods and definitions in this field as developed by the American Society for Testing Materials. In addition to all standards, the detailed methods for interpretation of refractory test data are included; there are comprehensive surveys showing service conditions of refractories in important consuming industries, and details are given of the standard samples of refractory materials.

Specification requirements cover various types of fireclay brick, ground fire clay and other refractories. The test methods include chemical analysis, cold crushing tests, high-temperature heat insulation, tests for resistance to spalling, particle size, permanent linear change after reheating, porosity and permanent volume changes, and pyrometric cone equivalent.

An important new section is intended as an acid in the design and operation of furnaces lined with refractories—this covers a recommended procedure for calculating heat losses through furnace walls.

The Trane Air Conditioning Manual, by William Goodman. Published by The Trane Company, LaCrosse, Wisconsin. 325 pages. $5 (including binder).

To collect, coordinate, organize, and to make comprehensible and available the store of knowledge on air conditioning is the function of this manual. It was written and compiled by William Goodman with the cooperation of the rest of the Trane engineering and laboratory staffs. The author also devised a psychrometric chart which, used with a specially designed ruler, enables one to solve the most intricate air conditioning problems with startling rapidity. Laborious calculations are eliminated.

Symposium on Corrosion Testing Procedures. Published by the American Society for Testing Materials. Size 6 x 9, 131 pages. Price $1.25 in paper binding; $1.50 in cloth.

This volume of 131 pages includes seven technical papers by twelve authorities and in addition extensive discussion of each paper, presented at the 1937 regional and annual meetings of A.S.T.M. Almost one-fourth of the book is devoted to discussion, thus making available the opinions of leading technologists and engineers.

Mechanical World Year Book for 1938. Published by Emmott & Co. Ltd., 31 King St. W., Manchester, England. Size 4 x 6; 360 pages.

The annual compilation of mechanical engineering data now in its 51st year of publication. A new section has been added on electric arc welding.

Carbon Brushes, by Dr. J. Neukirchen and Erle I. Shobert. Published by Stackpole Carbon Co., St. Marys, Pa. Size 5½ x 9; 163 pages. Price $3.00. Copies may be obtained from the Telegraph Press, Harrisburg, Pa.

This book is a presentation of the variables connected with current collection and commutation. The author, Dr. Neukirchen is Research Director of Ringsdorff Werke in Germany, and Mr. Shobert of the Stackpole Carbon Company, made the translation

into English. The basic theories of commutation and current collection are developed and the discussion stresses all of the various aspects and problems connected with current collection. These include arcing, electrolysis, polish, selective action, wear vibration, commutation, potential curve, sparking, interpoles and examples.

Designers and manufacturers of electroplating generators; also large users of this equipment will be interested in this book.

Copper in Cast Steel and Iron. Published by Copper Development Association, Thames House, Millbank, London, S. W. 1, England. Size 6 x 9; 136 pages.

This book deals exclusively with the influence of copper additions on the properties of cast steel and iron.

Government Publications

Unemployment Insurance. Information and forms to unemployed for filing their claims for insurance demands under the New York State law. Published by the Division of Placement and Unemployment Insurance, Department of Labor, 342 Madison Avenue, New York City.

Consumption of Tin in the Tin Plate and Terneplate Industry in 1936—Advance Summary. Bureau of Mines, U. S. Department of the Interior, Washington, D. C.

Technical Publications

Electrodeposition of Wire Drawing Lubricants, by Robert C. Williams, Chief Chemist of the Ironsides Co., Columbus, Ohio. Wire and Wire Products, Dec. 1937.

An investigation on wire drawing lubricants with particular reference to results obtained through electrodeposition. Electrodeposition has been demonstrated to be advantageous in obtaining superior lubrication when using certain wet drawing lubricants. Whether or not superior lubrication results from electrodeposition depends, to a large extent, on the physical nature of the deposited film.

As far as practical applications are concerned the current densities involved are reasonable (ranging from .003 Amp. to .16 amp. per sq. in., the latter being unnecessarily high).

The time of electrical contact necessary to deposit an effective lubricant film can be as short as 1/10 second, thereby indicating possible application on rod reduction continuous machines under proper conditions.

Lubricant has been deposited electrically on both non-ferrous and ferrous rods satisfactorily.

A Study of Conical Mandrel Test for Attached Lacquer Films, by H. G. Arlt, Bell Telephone Laboratories, Inc., New York City. A.S.T.M. Bulletin December 1937.

The distensibility of organic finishes has been determined for some years by bending finished panels around cylindrical mandrels, the mandrels in common use varying from 1/16″ in diameter to somewhat larger than 1 in. This test can be performed by clamping the finished panel and the mandrel in a vise and wrapping the panel around the mandrel manually. A device employing six mandrels ranging in size from ⅛ to 1 in. was designed some time ago[1] with a wrapping mechanism to insure a perfect wrap at all times. The upper surfaces of the wrapped specimens are elongated an amount which is an inverse function of the radius of curvature of the bend and a direct function of the thickness of panel stock used. A detailed discussion of the distensibility of the films appears in the appendix to this paper. Recently Group 6 of Sub-Committee XXV on Cellulose Ester Coatings of the Society's Committee D-1 on Paint, Varnish, Lacquer and Related Products, undertook a simplification of this machine which has resulted in the design of a conical mandrel test apparatus.

[1] A. E. Schuh, "Evaluation of Industrial Finishes", Industrial and Engineering Chemistry, Vol. 23, December, 1931, pages 1346-52.

Conclusions

1. From the limited data available at this time, it appears that the conical mandrel test gives the same results as the cylindrical mandrel test with the advantages of lower cost, simpler operating technique, and definite instead of limiting values. Further work in confirming this is suggested.

2. The conical mandrel as designed does not appear to introduce additional stresses of such magnitude as to give different elongation values than are obtained on cylindrical mandrels of the same range of diameters.

3. The conical mandrel test is a useful tool in determining changes in distensibility of lacquer films due to different environments of temperature and humidity.

4. The conical mandrel test appears to be a useful tool for formulation evaluation in that it is capable of accurately differentiating the effects of changes in composition.

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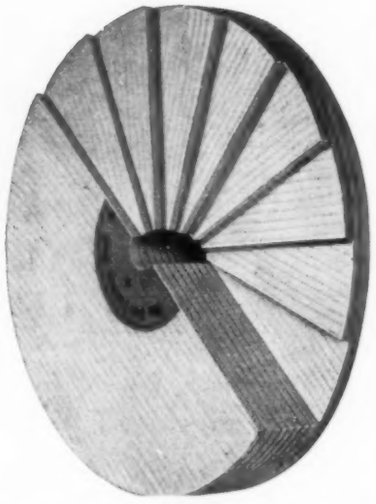

Cross Section Para-Sewed Blue Star Muslin Wheels Will Not Ridge

Polishing Wheels

Blue Star Polishing Wheels
Red Star Polishing Wheels
Green Star Polishing Wheels
Black Star Polishing Wheels

Bleached Muslin
Colored Muslin
New Cotton Woven Belting
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EVERY SIZE—SHAPE & DESCRIPTION FOR EVERY PURPOSE

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Plating and Polishing Equipment and Supplies

5. Elongation values are available for one panel thickness of three base materials. Values for the same thickness of other materials should be established.

6. An exact procedure of testing with the conical mandrel should be established.

The Role of Technical Information in Industrial Research and Development, by C. E. Homer and E. S. Hedges. Miscellaneous Publications. No. 6. International Tin Research and Development Council, 149 Broadway, New York City.

The Constitution of Tin-Rrich Antimony-Cadmium-Tin Alloys, by Prof. D. Hanson and W. T. Pell-Walpole. Technical Publications Series A, No. 61. International Tin Research and Development Council, 149 Broadway, New York City.

A Study of the Mechanical Properties of Tin-Rich Antimony-Cadmium-Tin Alloys, by Prof. D. Hanson and W. T. Pell-Walpole. Technical Publications Series A, Number 62. International Tin Research and Development Council, 149 Broadway, New York City.

The Corrosion of Tin in Nearly Neutral Solutions, by T. P. Hoar. Technical Publications Series A, No. 63. International Tin Research and Development Council, 149 Broadway, New York City.

Surface Tension and Viscosity Phenomena in Tinplate Manufacture, by Bruce Chalmers. Technical Publications Series A, No. 64. International Tin Research and Development Council, 149 Broadway, New York City.

Measurement of the Thickness of Tin Coatings on Steel by Magnetic and an Electromagnetic Method, by Bruce Chalmers, W. E. Hoare and W. H. Tait. Technical Publications Series A, No. 66. International Tin Research & Development Council, 149 Broadway, New York City.

The Wetting of Metals by Metals with Particular Reference to Tinning and Soldering, by E. J. Daniels and D. J. MacNaughtan. Technical Publications Series B, No. 6. International Tin Research & Development Council, 149 Broadway, New York City.

SYMPOSIUM ON THE LESS FAMILIAR ELEMENTS

Abstracts of papers read before the Division of Physical and Inorganic Chemistry of the American Chemical Society, Hotel Statler, Cleveland, Ohio.

Distribution of Rhenium, by Clarence Hiskey of the University of Wisconsin, and Dr. Loren C. Hurd of Rohm and Haas, Philadelphia, Pa.

Use of Less Familiar Elements in Vitreous Enamel Frits, by Glenn H. McIntyre, Ferro Enamel Corp., Cleveland, Ohio.

The Use of the Arc Spectra for the Quantitative Determination of the Members of the Rare Earth Group, by Prof. B. Smith Hopkins, University of Illinois, and co-workers, C. N. McCarty, L. R. Scribner and Margaret Lawrenz.

Metallurgy of Tungsten and Molybdenum, by Zay Jeffries and W. P. Sykes, General Electric Co., Cleveland, Ohio.

The Carbonyls of the Less Familiar Elements, by Prof. Arthur A. Blanchard, Massachusetts Institute of Technology.

The Occurrence of the Less Familiar Elements in Everyday Materials, by Bourdon F. Scribner, National Bureau of Standards.

Economics of the Less Familiar Elements, by H. C. Meyer, Foote Mineral Company, Philadelphia, Pa.

Associations and Societies

Chicago Branch, A. E. S.

SECRETARY-TREASURER, J. W. HANLON, 3004 N. WHIPPLE ST.

The 26th Annual Educational Meeting and Dinner Dance will be given by the Chicago Branch of the American Electro-Platers' Society, Saturday, January 15, 1938, at The Palmer House, Wabash Avenue and Monroe Street, Chicago, Illinois.

The Assembly for the Educational Session will be at 2 P.M. sharp. Several prominent

speakers of the Electro-Plating Field will present a fund of new developments in plating problems with many answers thereto.

pH and Electro Reactions, Ernest H. Lyons, Jr.

Alkaline Cleaners & Wetting Agents, Frank K. Savage.

A Review of Bright Nickel Processes in Commercial Use, Trouble Encountered in Their Use, and Proof Derived in Using "Bright Nickel," Oliver Sizelove.

Purification of Plating Solutions, by Electrolysis, V. Mattacotti.

Coloring of Cadmium, W. J. Erskine.

The Dinner and Dance will be held this year in the Grand Ball Room of The Palmer House, famous for its good food and ample space for the diners.

The tickets this year will be $3.25 per person.

Detroit Branch, A. E. S.

SECRETARY-TREASURER, THEODOR C. EICHSTAEDT, 679 VIRGINIA PARK, DETROIT, MICH.

The First Educational Session, Dinner and Dance of Detroit Branch, American Electro-Platers' Society was held in the Hotel Statler, Saturday, Dec. 4th, 1937.

The weather was not very favorable for those who lived outside of Detroit; consequently about 50 people were kept from attending.

The Educational Session which started promptly at one o'clock was well attended, there being 250 people in the hall. The speakers did a fine job, kept the audience listening, and they were plied with questions. The discussion after each paper showed how much interest there was at the Session.

At 7:30 the dinner started in the large banquet hall. The decorations were a wonderful sight to behold. The music was perfect and all the ladies received beautiful favors. The dinner was also good. In other words the whole affair was "*par excelente.*"

There were 407 people served for dinner by actual count. The entertainment was also "*par excelente.*"

New York Branch, A. E. S.

SECRETARY, FRANKLYN J. MACSTOKER, 25 PRINCETON ST., GARDEN CITY, N. Y.

The New York Branch resumed their bimonthly and educational meetings during the month of November at their headquarters in the Hotel Pennsylvania.

However, before their Fall & Winter program of activities were begun the Branch voted to tender a testimonial dinner to the members of the Silver Jubilee Convention Committee on Saturday evening, November 6th, also at the Pennsylvania Hotel. The officers and old time members of the Branch were present with the members of the Convention Committee itself. The Branch took the opportunity at this time to present a token of esteem and appreciation to the members of the Convention Committee for their effort in promoting the Silver Jubilee. *President Liguori* acted as toastmaster and made the presentations but turned over the job of presenting *Tom Trumbour* of METAL INDUSTRY, a hard worker on the New York Committee, with several golf rods, to the chairman of the Convention Committee, *F. J. Mac Stocker. Mr. Liguori* was tired of hearing *Tom* alibi his third rate golfing performances and asked Mac to take this means of providing against it!

The second meeting, Friday, November 26th, was an open meeting, the first of several New York proposes to hold during the Winter. It was featured by a lecture by *Dr. C. B. F. Young,* electrometallurgist, an instructor on the staff of Columbia University, Division of Electro-Plating Education and a member of the New York Branch. *Dr. Young* had for his subject of the evening *"The Corrosion of Iron & Steel from the Electro-Platers' Viewpoint." Dr. Young* lectured and answered questions for an hour and a half. The interest on the part of many engaged in nickel and chrome plating iron and steel was manifested by the discussion. There were eighty-five in attendance on this occasion. *Dr. Young* was extended a rising vote of thanks for his interesting discourse. *President Liguori* of the Branch called upon *Vice-President Franklyn J. Mac Stocker* of the A. E. S. for a few remarks. *Mr. Mac Stoker* responded with an appeal to the platers of the Metropolitan Area to take advantage of the opportunities extended through membership in the A. E. S. and invited all eligible to come in and interest themselves in this connection. The meeting adjourned at 10:30 P. M., after which many present renewed old acquaintances and talked of things of common interest.

During the months of January and February, the Branch will present for the interest of their members and visitors several well known lecturers on subjects of current interest in the metal finishing field, including *Albert Hirsch* of Philadelphia Branch, a member of the Research Committee of the A. E. S., *Dr. William Blum* of the Bureau of Standards, Washington, D. C. and *George B. Hogaboom,* electro-plating engineer and past president of the A. E. S. These lectures will be held at the Branch Headquarters in the Conference Rooms of the Pennsylvania Hotel, 7th Avenue & 33rd

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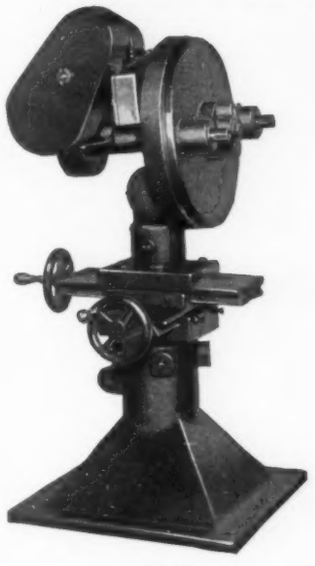

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Street, N. Y. C., and will be well worthy of attendance by the members and visitors. For further information communicate with the secretary, Franklyn J. Mac Stoker, 25 Princeton St., Garden City, N. Y.

St. Louis Branch, A.E.S.

SECRETARY, C. T. MCGINLEY, 8331 WASHINGTON ST., ST. LOUIS, MO.

The St. Louis Branch of the American Electro-Platers' Society has postponed, indefinitely, the banquet and educational session which they had planned to hold on January 22nd.

Revised arrangements will be published as soon as they have been completed.

Institute of Metals Division

29 W. 39TH ST., NEW YORK

The Institute of Metals Division, A.I.M.E., will hold its Annual Winter Meeting February 14-17, 1938. This meeting will include sessions on Constitutional Diagrams, Properties and Uses of Non-Ferrous Metals, Physics of Metals, Structure-Sensitive Properties of Metals, Deformation and Re-Crystallization, Damping Capacity and Diffusion, Powder Metallurgy, Hard Carbides, Copper Alloys and Platinum Metals.

The Annual Institute of Metals Division Lecture will be given by *Prof. P. W. Bridgman*, Harvard University on "*The Nature of Metals as Shown by Their Properties Under Pressure.*" The *Howe Memorial Lecture* will be delivered by *Dr. Frederick M. Becket*, president, Union Carbide and Carbon Research Laboratories, Inc.

American Foundrymen's Association

222 W. ADAMS ST., CHICAGO, ILL.

A regional two-day foundry conference is announced by the American Foundrymen's Association to be held at the Hotel Schroeder, Milwaukee, Wis., February 3 and 4, under the auspices of the Milwaukee Chapter of the American Foundrymen's Association, cooperating with the staff of the Mining and Metallurgical School of the University of Wisconsin, Madison.

All foundrymen are invited to attend the February meeting which, according to present plans, will include a series of sessions on non-ferrous foundry problems. In general, the subjects to be covered by each of the discussion groups will be as follows: Melting, Casting, Sand, Special Metals, Apprentice Training and Foundry Management.

Equipment Meeting

The Northeastern Ohio Chapter of the American Foundrymen's Association is arranging a very interesting meeting for their January 13th get-together. The meeting, which falls on Thursday evening, will be held at the Cleveland Club, East 107th and Carnegie Avenue, and will start with the customary 6:15 P. M. dinner.

The meeting will be given over to a consideration of the new and interesting developments in the foundry equipment field. Speakers will devote their efforts to describing the new phases of their particular equipment and will refrain from presenting sales arguments or comparisons with other equipment. Each speaker will be allotted a period of time during which to present his story. Some will use moving pictures, lantern slides and other helps.

Connecticut Non-Ferrous Foundrymen's Association

SECRETARY, L. G. TARANTINO, 670 W. JACKSON AVE., BRIDGEPORT, CONN.

A meeting was held on Tuesday, December 21st at the Hotel Duncan, New Haven, Conn., presided over by *T. Joseph Judge*. About 40 members attended.

George Belknap of the *Belknap Mfg. Company*, Bridgeport, Conn., spoke on the subject of "Cores and Machine Core Blowing." New officers for the coming year are as follows:

President: *H. A. Phelps*, Phelps Foundry Co., Ansonia, Conn.

Vice-President: *D. Wesley Case*, The Belknap Mfg. Co., Bridgeport, Conn.

Treasurer: *Ernest Stone*, Consolidated Ashcroft Hancock Company, Bridgeport, Conn.

Secretary: *Louis G. Tarantino*, 670 W. Jackson Ave., Bridgeport, Conn.

Technical Secretary: *L. A. Ward*, Chase Brass & Copper Co., Waterbury, Conn.

Executive Committee:

Chairman, T. Joseph Judge, Jenkins Bros. Co., Bridgeport, Conn.; *S. W. Chappell*, Electric Boat Co., Groton, Conn.; *F. B. Clarke*, Whitehead Bros. Co., Providence, R. I.; *Byron Ried*, Reading, Pratt & Cady Co., Hartford, Conn.; *George King*, Malleable Iron Fittings Co., Branford, Conn.

The next meeting will be held at the Hotel Duncan, New Haven, Conn., Tuesday, January 18, 1938 with dinner at 6:30 P.M., after which the meeting will adjourn to the Ma-

sen Laboratory of Yale University for a joint meeting with the New Haven Chapter of the American Society of Mechanical Engineers on the subject, "*Casting Design and Alloy Specification.*"

Dust Control Equipment Association

PENTON BLDG., CLEVELAND, O.

Arthur J. Tuscany, Executive Secretary and Treasurer of the Dust Control Equipment Association, Penton Building, Cleveland, announces that at the recent meeting of the Association held at Cleveland Hotel, Cleveland, Ohio, on Tuesday, November 16, the following officers were elected for the ensuing period: Chairman, *John Hellstrom*, Vice President of the American Air Filter Company, Louisville, Kentucky; Vice Chairman, *S. S. Parsons*, Parsons Engineering Corporation, Cleveland. *Mr. Tuscany* continued as Executive Secretary and Treasurer.

Announcement is also made of further progress in the organization's program which has been under way for some time, looking toward developing standards of dust control practice which will be of material help to the purchaser as well as the manufacturer of dust control equipment. In its work in this direction the Association is cooperating with the Hygiene Codes Committee of the American Foundrymen's Association, Committee Z-9 of the American Standards Association—dealing with fundamentals relating to the design and operation of exhaust systems, and also any work which the Air Hygiene Foundation may do in this connec-

The membership of the Association is comprised of the following companies: *American Air Filter Company*, Louisville, Ky.; *American Foundry Equipment Company*, Mishawaka, Ind.; *Parsons Engineering Corporation*, Cleveland, Ohio; *W. W. Sly Manufacturing Company*, Cleveland, Ohio; *C. B. Schneible Company*, Chicago, Ill.; *Whiting Corporation*, Harvey, Ill.

The Board of Directors of the Association has set the time and place of the Annual Meeting of the organization for Tuesday, February 8, 1938, in the Empire Room of the Cleveland Hotel, Cleveland, Ohio.

In addition to handling such routine matters as the election of three directors to fill expiring terms, the Association will give further consideration to certain enlarged activities recently inaugurated. One is the broadening of its Credit Interchange work. Another deals with completion of plans to develop an industry directory of companies in the foundry business. In addition, the meeting will give consideration to plans for the new year. As the new Congress will have been in session sufficiently long to at least indicate a direction, consideration will be given to those things which should be undertaken to safeguard and protect the interests of every individual company.

Porcelain Enamel Association

SECRETARY, W. H. CHANDLER, CHANDLER CHEMICAL CO., CLEVELAND, O.

J. J. Clay, of the *Public Service Supply Company, Inc.*, Cleveland, Ohio, was announced as president of the newly formed *Porcelain Enamel Sales Associates*. *W. H. Chandler*, of the *Chandler Chemical Company*, also of Cleveland, was elected secretary of the Association.

The purpose of the Association is to extend the use of porcelain enamel into the basic industries and is composed of the following companies: *O. Smith Johannsen Company*, New York City; *Peerless Equipment Company*, Chicago, Ill.; *Chandler Chemical Company*, Cleveland; *Hodson-Miller Corporation*, Detroit, Mich., and the *Public Service Supply Company, Inc.*, Cleveland.

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American Council of Commercial Laboratories

SECRETARY, D. E. DOUTY, U. S. TESTING CO., HOBOKEN, N. J.

Representatives of twenty of the principal commercial laboratories of the United States had a meeting in Chicago, during the week of Nov. 8th, completed the organization of the American Council of Commercial Laboratories. One of the purposes of the Council will be the promotion of the proper use of scientific testing methods for the protection and certification of quality in advertised goods.

Members have been, and will be carefully selected as organizations which are unbiased and uninfluenced by any ulterior considerations. The following officers and executive committee members were elected for 1938:

President—Preston S. Millar, Electrical Testing Laboratories, New York, N. Y.

Vice-President—Monroe L. Patzig, Patzig Testing Laboratories, Des Moines, Iowa.

Secretary—D. E. Douty, United States Testing Company, Hoboken, N. J.

Treasurer—A. R. Ellis, Pittsburgh Testing Laboratory, Pittsburgh, Pa.

Members of Executive Committee: *James H. Herron*, The James H. Herron Company, Cleveland, Ohio; *F. B. Porter*, Southwestern Laboratories, Fort Worth, Texas; *T. A. Wright*, Lucius Pitkin, Inc., New York, N. Y.

Cooking and Heating Appliance Institute

SHOREHAM HOTEL, WASHINGTON, D. C.

The 5th Annual Convention of The Institute of Cooking and Heating Appliance Manufacturers was held at the Netherland Plaza Hotel, Cincinnati, Nov. 29-Dec. 3. An attendance of over 250, largest in the Institute's history, represented 117 of the industry's leading manufacturers and supply organizations. *Lewis Moore, Jr.*, of *The Kalamazoo Stove Co.* and President of The Institute, was Chairman of the meetings. *A. P. Chester*, Vice-President of *Globe-American Corporation*, Kokomo, Ind., was Chairman of the program committee. The Convention was addressed by a number of speakers of national prominence including *Dr. Glenn Frank, Grant L. Cook, Dr. Robert A. Kehoe, R. C. Todd* and *Charles P. Taft.*

In the election of officers *Alden P. Chester*, Vice-President of *Globe-American Corporation*, Kokomo, Indiana, was named President; *C. Ackerson*, Vice-President of *Agricolo Furnace Co.*, Gadsden, Ala., Vice-President and *Garvin M. Brown*, President of *Indianapolis Stove Co.*, was made Secretary.

Personals

Dr. Francis C. Frary

The Pittsburgh Award for 1937 was conferred upon Dr. Francis C. Frary, director of research of the Aluminum Research Laboratories of the Aluminum Company of Pittsburgh, Pa., by the Pittsburgh Section of the American Chemical Society. This high honor was last conferred upon Andrew W. Mellon and Richard B. Mellon in recognition of their services to chemistry as evidenced in the founding of the Mellon Institute of Industrial Research. The formal presentation will be made at a meeting of the Section on February 24.

Dr. Frary, through his achievements in the metallurgy of aluminum, has helped to bring to Pittsburgh an international reputation for research in metals. He has been directing research in aluminum ever since he was appointed to his present post in 1918.

Born in Minneapolis, he studied at the University of Minnesota, where the degree of analytical chemist was conferred on him in 1905; a year later he received a master's degree. After studying at the University of Berlin, he joined the teaching staff of the University of Minnesota. His postgraduate work resulted in a doctor's degree, received in 1912.

In 1915 Dr. Frary joined the staff of the Oldbury Electrochemical Company, Niagara Falls, N. Y., as research chemist. There he acquired special experience in the production of phosgene, which led, during the war, to his selection, with Prof. D. J. Demorest, to build and operate a phosgene plant at Edgewood Arsenal. At the close of the war, Dr. Frary was a major in the Chemical Warfare Service.

In December, 1918, he took up his duties as director of research of the Aluminum Company of America. Starting at New Kensington with a small group of men, he gradually built up the Aluminum Research Labora-

Dr. FRANCIS C. FRARY

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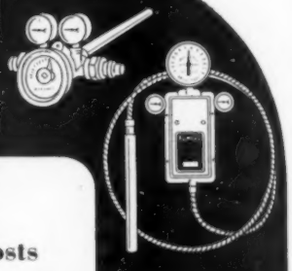

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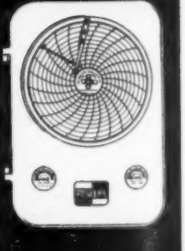

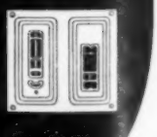

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tories to their present eminent position. In the past nineteen years, Dr. Frary made important contributions to the chemistry and metallurgy of aluminum. Among the many achievements which have been credited to Dr. Frary may be mentioned the production, for the first time, of very pure aluminum (99.98 + per cent) by an electrochemical process, and the production of pure aluminum oxide by an electrothermal process.

Willis M. Peirce has been appointed Chief of Research of the New Jersey Zinc Company, Palmerton, Pa. Mr. Peirce has served successively as Investigator, Section Chief and Division Chief in the Research Department of the Company. He has made significant contributions to the development of zinc and zinc alloys, especially in the die casting field. He is a Past Chairman of the Institute of Metals Division, A.I.M.E., and is now a member of the Board of Directors. He is one of the representatives of the Institute on the Metallurgical Advisory Committee of the National Bureau of Standards and Chairman of the A.I.M.E. Committee on the Correlation of Research.

Frank L. Neward, 608 Marquette Bldg., Detroit, Michigan, has been appointed as representative in Michigan for The Gehnrich Corp., Skillman Ave. & 35th St., Long Island City, N. Y. His office is equipped to engineer and make recommendations with regard to industrial oven and dryer problems in metal finishing or baking and kindred operations.

S. C. Taormina has been appointed Technical Director of the Platers Research Co., 72 Grand Avenue, Brooklyn, N. Y. *Mr. Taormina* graduated from the Industrial Chemical Engineering course at Pratt Institute of Technology in June 1923. Since then he has been chemist and engineer for a number of firms in related industries. In 1932 he joined the *U. S. Research Corporation,* under *Dr. L. C. Pan,* as service engineer, and later succeeded *Dr. C. B. F. Young* as Technical Director. In July 1937 *Mr. Taormina* opened his own laboratories as consultant in the electroplating field. He is the author of a number of papers, among which is "*Silver Plating to Specifications*" by *Dr. C. B. F. Young,* and *S. C. Taormina,* METAL INDUSTRY, May, 1935, p. 165-7.

Dr. C. B. F. Young, Consulting Electrochemist who has appeared a number of times in the columns of METAL INDUSTRY, has been appointed Technical Advisor to the Platers Research Company, 72 Grand Ave., Brooklyn, N. Y. This company specializes in the manufacture of control units for the analysis of electroplating baths.

Ferro Enamel Corporation, Cleveland, Ohio, announced today the transfer of *Harry Marks* from the Cleveland plant to the company's branch plant located at Sao Paulo, Brazil. At Sao Paulo he will have complete charge of Ferro Enamels South America. To assist *Mr. Marks, Roland Schlegel* has been transferred to Sao Paulo from another branch plant at Buenos Aires, Argentina. Other changes announced by the company are the transfer of *Ralph Bevis* from Cleveland to Buenos Aires, where he will take charge of technical and control work of Ferro-Argentina and the promotion of *A. B. Kimpel* to replace *Mr. Marks* as export manager of the Cleveland plant.

D. M. Curry will give an illustrated lecture before the Philadelphia Chapter of the American Foundrymen's Association on January 14, 1938. In his talk, *Mr. Curry,* who is a member of the Development and Research Division of *The International Nickel Company, Inc.,* 67 Wall St., New York, will discuss *New Developments in White Nickel Casting Alloys.* The meeting will be held at the Engineers Club and will be preceded by a dinner at 6:30 P.M.

Announcements of three new appointments to posts within the manufacturing organization of the *General Electric Company* have been made at Schenectady by *W. R. Burrows,* vice president in charge of manufacturing, as follows: *A. T. Chandonnet,* secretary of the manufacturing committee, to be assistant manager of the Elmira Foundry Company, Inc., of Elmira, N. Y., an affiliated company; *Giles S. Maxwell,* present supervisor of costs, to succeed *Mr. Chandonnet* as secretary of the manufacturing committee; and *Thomas D. Foy,* on special assignments in the manufacturing organization, to succeed *Mr. Maxwell* as supervisor of costs. The appointments are effective January 1, 1938.

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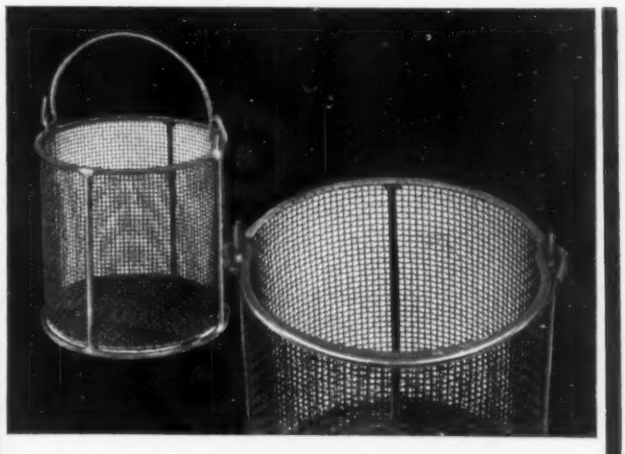

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Obituaries

Leonard Schmidt

Leonard Schmidt, service man of Chas. F. L'Hommedieu & Sons Co., 4521 Ogden Ave., Chicago, Ill., died on November 14th.

Mr. Schmidt had been employed by the above company for eight years. Previously he had been for many years in charge of the plating department of the U. S. Slicing Machine Company.

LEONARD SCHMIDT

Mr. Schmidt was very active in the American Electro-Platers' Society. His long experience in plating and polishing fields and his readiness to help others with their problems made friends for him wherever he went.

His loss is deeply regretted by all who knew him.

Frank B. Black

Frank B. Black, died recently at his home on Marion Rd., Mansfield, Ohio. Mr. Black was chairman of the Board of Directors of the Ohio Brass Company, which he founded half a century ago. He was 72 years old.

Born in Mansfield, Mr. Black was educated at the local High School. A former president of the Ohio Brass Company, he had been Chairman of the Board since 1930. Mr. Black was also a director of two banks.

Surviving are his widow and three sons, Robert B., Donald S. and Roger A. Black, Mansfield.

Benjamin Lissberger

Benjamin Lissberger, chairman of the board of the Federated Metals Division of the American Smelting & Refining Co., died November 19th at his home, 270 Park Ave., New York City, from a heart ailment.

Mr. Lissberger, in his 62nd year, had been an outstanding figure in the secondary metal industry in the United States for over 40 years.

William P. Trench

William P. Trench, who, prior to his retirement from active business in 1936, had been associated with the American metal trade for 56 years, died in his home in Brooklyn, on December 24th, at the age of 76. He was a member of the firm of C. S. Trench & Company of New York. Mr. Trench was a charter member of the New York Metal Exchange and continued his membership for more than 30 years.

He was a gentleman of the old school with a high dignity and integrity.

W. C. Hopkins

W. C. Hopkins, for the past seven years secretary of Henry V. Walker Company, Elizabeth, N. J., died suddenly at his home on January 9th, 1938, in East Orange, N. J., after an operation. Mr. Hopkins was 55 years old.

Arthur L. Devonshire

Arthur L. Devonshire, mechanical superintendent, Howard Clock Co., Waltham, Mass., died November 30th, following an operation.

A. E. Kayes

A. E. Kayes, superintendent of the refinery plant of the International Nickel Co., died November 5th at St. Mary's Hospital, Huntington, W. Va. Mr. Kayes was the second president of the Electric Makers Guild. His associates credited him with the development of a great number of non-ferrous alloys. Mr. Kayes had traveled throughout the United States and Canada as a consultant on electric furnace refining methods.

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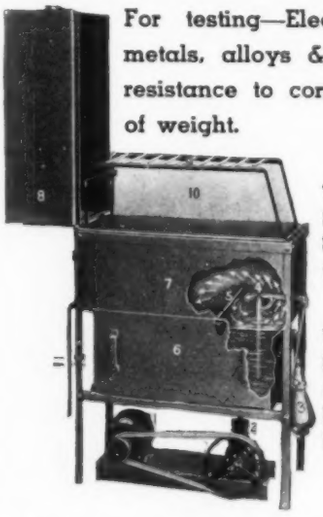
THE PACKER MACHINE CO. MERIDEN, CONN.

SALT SPRAY TESTING EQUIPMENT



For testing—Electroplated & coated metals, alloys & Paints to determine resistance to corrosion, pitting & loss of weight.

The U. S. Bureau of Standards recommends Salt Spray test for this type of examination.

Units are made in two Standard Sizes — Test cabinets measuring — 23" high x 12" wide x 26" long & 29" high x 14" wide x 33" long.

A test of just a few hours in Salt Spray compares with many months test in the open. Effect big savings by testing different plating on production parts.

INDUSTRIAL FILTER & PUMP MFG. CO.

3017 W. Carroll Ave. Chicago, Ill.

Verified Business Items

Michigan Buff Company, Inc., 4054 Beaufait Ave., Detroit, Mich., has been in business for several years buying and selling used buffs from the Atlantic Coast to the Pacific Coast. The company having made great progress is now located in much larger space in a modern factory building at above address.

Wright & Gade Equipment Co., 3701 N. Broad St., Philadelphia, Pa., has been appointed representative for the complete line of flexible shaft equipment and tapping machines made by the R. G. Haskins Co., 4636 W. Fulton St., Chicago, Ill.

J. H. Winn's Sons, Winchester, Mass., manufacturers of clock and watch hands, and dial hands, are constructing a two-story and basement addition, 42 x 50 ft., and alterations in present plant. Cost close to $40,000. Departments: stamping, soldering, metal spraying, grinding, polishing and buffing, electroplating and lacquering.

Duriron Co. Inc., Findlay Street, Dayton, Ohio, manufacturer of alloy castings, has asked bids on general contract for a one-story foundry addition, 80 x 80 ft. Cost close to $40,000 with equipment. Departments: ferrous casting shop, grinding.

Taylor-Young Airplane Company, Alliance, Ohio, has plans for expansion and improvements including one or more one-story units. Cost about $100,000 with equipment. Departments: tool room, stamping, metal spraying.

The *Trane Company* of La Crosse, Wisconsin, manufacturers of heating, cooling, and air conditioning equipment, has established a new transportation department at 852 North Rush Street, Chicago.

MacDermid Inc., Waterbury, Connecticut, has been appointed New England Sales Agent for the Sulflo Corp of America. This company manufactures a complete line of metal working lubricants, specializing in the Sulflo abrasive carriers, anti-rust compounds and grinding materials. The main office and works of the Sulflo Corp. are Elizabeth, New Jersey.

The *Lincoln Electric Company*, manufacturers of arc welding equipment, Cleveland, Ohio, announces the opening of a welding sales-engineering office in Atlanta, Georgia, at 412 Title Building, under the management of *Robert Daniels*.

A new building to provide additional office and laboratory facilities for the *Parker Rust-Proof Co.* is under construction on East Milwaukee Avenue, Detroit, Mich. The new addition, adjacent to their present building, will be a two-story fire-proof structure extending 148 feet along Milwaukee, thus doubling their frontage, and 152 feet to the rear. The front will conform architecturally with the present building. One portion of the ground floor of the new addition will be devoted to an enlarged testing and demonstration laboratory equipped with the latest precision instruments and equipment for testing and studying surfaces. The rest of the space will be devoted to a sheet metal shop and storage space for rust-proofing chemicals. The second floor will be devoted exclusively to office and laboratory space which will provide enlarged and improved facilities for the legal, engineering, filing, and accounting departments.

Loyal Metal Products Corp., 95 Lorimer St., Brooklyn, N. Y., has installed a plating plant for chromium plating tubular furniture. They will put out a quality product which they intend to be a credit to the electroplating industry. They also state "*We are following the advertisements in* METAL INDUSTRY *very carefully and have contacted quite a number of your advertisers to get the best possible equipment and materials in the fabrication of our product.*"

United Laboratories, Inc., Linden, N. J., are manufacturers of a complete line of polishing and buffing compositions such as stainless steel, Tripoli, chrome rouge and lime, etc. They also have for resale, loose grains such as Turkish emery, American emery, aluminum oxides, hide glue, etc.

Whether it's a heavy-duty job, or delicate jewelry finishing . . .

KALYE

SAVES *time*

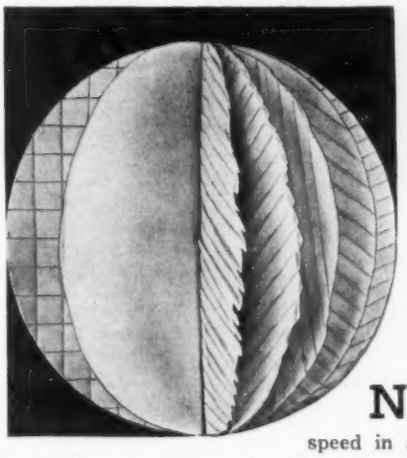
SAVES *material*

Recommended by 50 years of brilliant service on the most varied and exacting cleaning jobs.

Not the cheapest . . .
but *cheapest in the long run!*

Send for free copy of the Kalye manual.

RUMFORD CHEMICAL WORKS
RUMFORD, RHODE ISLAND



Make A Shop Test Of Yerges Buffs

NO OTHER buff gives such economy and speed in all cutting and buffing operations as a Yerges buff because no other buff is designed and made in the same way. The square-stitched, pleated sections of special muslin are bias-cut and each piece is laid at a specified angle to the next piece. Pockets automatically form at the edge as the buff wears, holding and saving abrasive.

Yerges buffs are available for a wide variety of work, from the softest buffing to the hardest cutting. Let us send you samples and data. The Yerges Mfg. Company, Fremont, Ohio.

YERGES

The *Madison-Kipp Co.* of Madison, Wisconsin, has just been granted a non-exclusive license under patent No. 1,589,857 issued June 22, 1926, the patent application for which was filed August 26, 1922. The patent is owned by M. Katcher, consulting engineer, 40 E. 49th St., New York City. This patent broadly covers important features of modern die-casting machines using air pressure for forcing molten metal into a die supported by the machine.

Eclipse Air Brush Co., Inc. announces the removal of its office and factory to 390 Park Avenue, Newark, N. J., after twenty-nine years in downtown Newark. The building formerly occupied by the company was damaged by fire on December 14 in one of the largest and most serious blazes in Newark for many years. Production and shipping schedules are being maintained from the Park Avenue address.

The *Martindale Electric Co.*, Cleveland, Ohio has purchased The *Hergi Mfg. Co.* of Bridgeport, Conn., and has moved the factory to Cleveland where they will continue to manufacture the same extensive line of motor driven, flexible shaft equipment, and carbon, alloy, and high-speed steel rotary files, rasps and burrs.

The *Revolite Corporation*, New Brunswick, N. J. announces that beginning January 1, 1938, a change of name will take effect. The Revolite Corporation will be known as *Industrial Tape Corporation*, New Brunswick, N. J. The products of the Industrial Tape Corporation will be the same as heretofore—Permacel, the paper masking tape; Jonflex, a fine cloth masking tape, Industrial, coarse cloth masking tape, similar to Jonflex but with a heavier and coarser back cloth for heavy duty jobs; Electape with the flexible bakelite coating; Utilitape, the waterproof, all-purpose, handy adhesive tape, in a large range of colors, and special adhesive tapes for every industrial purpose.

Homestead Valve Mfg. Co., Inc., Coraopolis, Pa., announce the appointment of the following firms as distributors of Hypressure Jenny, their steam vapor spray cleaner: *Dyke Motor Supply Co.*, 800 Webster Ave., Pittsburgh, Pa.; *Cole Bros.*, 110-13th Ave., Nashville, Tenn.; *City Auto Parts*, 17 Church St., Worcester, Mass.; *Automotive Supply Co. Inc.*, 116 W. Harris St., Appleton, Wisc.

Detroit National Guard Armory at Detroit, Mich., on October 27th, was taken over by the *Trane Company*, La Crosse, Wisc., for a gathering of 250 plant engineers and factory maintenance men to become acquainted with the new Trane projection unit heater by means of a practical demonstration.

Lincoln Electric Co., Cleveland, Ohio, announces the opening of a new sales office in Phoenix, Ariz., in charge of *R. J. Reardon*. They also announce the appointment of *Robert H. Schuster* to the sales staff of the Pittsburgh office.

Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill., has purchased the assets, manufacturing plant and equipment from *Wappat Inc.*, Pittsburgh, Pa., taking over the entire line of Wappat portable tools, saws, grinders, drills, which will be manufactured by the Mall company and can be purchased from the established Wappat jobbers and distributors, from the Mall Tool Company jobbers and distributors, or directly from the Mall company.

The *Incandescent Lamp Manufacturing* plant of the *Westinghouse Electric & Mfg. Company*, at Trenton, N. J., has completed 1,000,000 man-hours without a disabling accident, and a similar plant at Bloomfield, N. J., has completed a million and a half man-hours without a disabling accident.

General Plate Company a division of *Metals & Controls Corp.*, Attleboro, Mass., has purchased the thermostatic metal, electrical contact and contact material business and good will of *Laminated Metals Corp.*, 775 Eddy St., Providence, R. I. *B. W. Dezotell*, Manager of this Division of the *Laminated Metals Corp.*, is now associated with General Plate and will give personal attention to this work.

Zialite Corp., has moved from its offices at 521-5th Avenue, New York City, to 10 N. Bleecker St., Mt. Vernon, N. Y., where they are occupying larger quarters and have consolidated their office, laboratory and plant.

The *Pangborn Corporation*, Hagerstown, Md., reports that their shop employees, acting without advice or suggestion from foreman, superintendent or other company official, grouped together on Christmas and presented *Thomas W. Pangborn*, President, *John C. Pangborn*, Vice President and *George S. Goodrich*, General Superintendent, with individual baskets of poinsettia and silver pledges of loyalty in the shape of a loving cup, water pitcher and service tray, respectively. The employees did not allow any one to contribute more than 25c as his share of the expense.

The plant of the *International Silver Co.*, Waterbury, Conn., closed permanently on Dec. 31. About 380 persons were thrown out of work. The business and machinery will be transferred to the main plant in Meriden but it was said that it was doubtful if any of local employees can be given work there. The local plant was one of the original plants of Rogers & Bros. and has been in continuous operation since before the Civil War. —W. R. B.

Aluminum Cylinder Head Research Program

At a meeting of aluminum cylinder head manufacturers just concluded in this city, a joint program of engineering and metallurgic research has been formulated to correlate progress in automobile engine design and materials in relation to cylinder heads.

An extensive program of laboratory work is being prepared on a cooperative basis by the leading aluminum cylinder head manufacturers, including *Aluminum Company of America*, Cleveland, O.; *Bohn Aluminum and Brass Corporation*, Detroit, Mich.; *Aluminum Industries, Inc.*, Cincinnati, O.; *Advance Aluminum Castings Corporation, National Bronze and Aluminum Foundry Co.* and *The Permold Company*.

Stevens Sales Convention

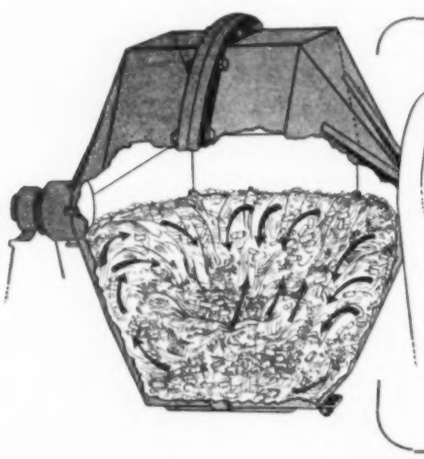
The Second Annual Sales Convention of Frederic B. Stevens, Inc., Detroit, Mich., was held on December 29-30, 1937, at the Hotel Statler, Detroit.

The program featured discussions on plating and polishing room materials. Among the papers presented were the following:

Buffing Compositions, by *L. R. Eastman*

Plating Equipment, by *A. H. Hannon*

At the Annual Banquet, the speakers included *M. B. Bingay*, managing editor, Detroit Free Press, and the *Hon. James F. Hughes*, ex-Congressman from Wisconsin.



Cut Costs in 1938 with the HARTFORD *TRIPLE ACTION* Cutting Barrel

This new type barrel is so constructed that it produces a *TRIPLE ACTION* by tumbling the material over-and-over, end-for-end, and giving it a continuous infolding motion. This multiple action grinds off the burrs quickly and does an exceptionally thorough job in smoothing and finishing the surface of each article carried in the load.

The HARTFORD Barrel reduces the cost of Mixing, Tumbling, Pulverizing, Dry or Wet Grinding, Cutting Down or any similar tumbling operation. Motor or Belt drive.

Our engineering department will give you full technical details about these better methods. Write us.

THE HARTFORD STEEL BALL COMPANY

Steel Burnishing and Polishing Balls
Odd Shapes Steel Burnishing Material
HARTFORD, CONN.

Always on Duty—"Sergeant Burr Nish"

New Additions to the Plant of Hanson-Van Winkle-Munning Company

Because of the steadily increasing activity in the electroplating industry and because the Hanson-Van Winkle-Munning Company, manufacturer of electroplating equipment and supplies, Matawan, N. J., has obtained such a large share of this increased business, a considerable expansion program has been undertaken by the company. A new office building has been built on Church Street, connected with the main office by a bridge.

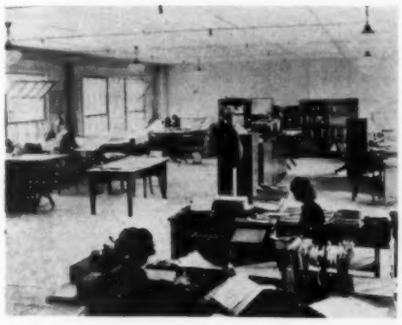


Fig. 1. The new drafting and engineering room of the Hanson-Van Winkle-Munning Co., Matawan, N. J. The light speaks for itself!

The additional space (approximately 2,000 sq. ft., making a total of 10,000 sq. ft. of office space in all) is used as a drafting and engineering room. The second extension within two years has been added to the electrical shop. The building recently constructed is 54x72, which, with the first extension of 38x54 adds a total of about 6,000

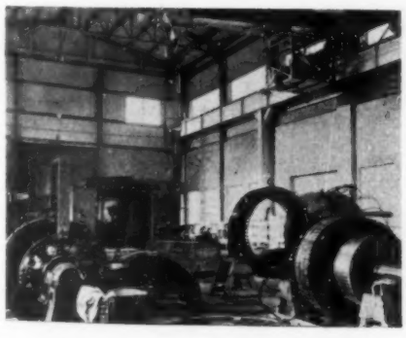


Fig. 2. The most recent addition to the electrical shop of Hanson-Van Winkle-Munning Co., Matawan, N. J., showing freight car in loading position, 60 ton crane and generators in process of being assembled.

sq. ft. of additional space. A new railroad spur has been built with sunken tracks so that the car floor is on a level with the new concrete loading platform. A 60 ton crane has been erected for loading and unloading heavy equipment. A new electrical substation has been installed to take care of the additional load.

GOLD, SILVER and COPPER
BRONZE POWDERS
ALUMINUM PASTE and PAINT
For All Industrial Purposes

Samples & quotations upon request

CRESCENT BRONZE POWDER CO.
118 W. Illinois St. Chicago, Ill.

Acid-Proof Tanks

Gal.	Length	Width	Depth	List Price
4	12"	9"	9"	$14.00
10	16	12	12	23.00
16	20	16	12	32.40
26	24	16	16	42.00
38	28	20	16	65.00
41	24	20	20	66.00
44	32	20	16	78.00
66	32	24	20	96.00
69	40	20	20	104.00
104	36	28	24	140.00
119	48	24	24	152.00
149	60	24	24	206.00
210	48	32	32	248.00
320	72	32	32	360.00

Special sizes made to order. List prices subject to discount.

Made of 'DENSTONE' Acid-Proof Chemical Stoneware, dense-bodied and non-porous, —out of De-Aired (Vacuum-ized) clays.

All Tanks are unqualifiedly recommended for electro-plating, galvanizing and pickling work. The dense, granite-like body is acid and corrosion-proof all the way through.

The U.S. Stoneware Co.
62 East 42nd St., New York

U.S. STONEWARE ACID-PROOF

CLEPO *Not just a cleaning compound but a*
Scientific Cleaner Service . . .

Metal Cleaning is a simple matter when everything is right. But everything is right only when the cleaning operation begins where the cleaning compound is made, and ends in your plant through the medium of unremitting service by the maker of the compound. CLEPO cleaning compounds are sold on that basis.
CLEPO service does not consist simply of leaving you with a quantity of chemical. It includes a definite effort to aid you in fitting the right cleaner to each job in your plant. We believe this method is the only means by which you can reduce rejects to the barest minimum and eliminate blistered or peeled deposits, or other defects caused by improper cleaning.
CLEPO cleaners do this because they are scientifically compounded of high purity chemicals; always uniform; always supported by CLEPO service.

FREDERIC GUMM CHEMICAL CO., INC.
538-542 FOREST STREET KEARNY, NEW JERSEY
TECHNICAL ADVISORS and SALES REPRESENTATIVES
OLIVER J. SIZELOVE, General Technical Advisor and Sales Representative
WILLIAM VOSS — JACOB HAY — GEORGE GEHLING
METROPOLITAN — WESTERN — PHILADELPHIA

STANLEY

Quality Begets Quality

Time and again this has been proven thru the use of Quality Coatings on the products of hundreds of manufacturers.

STANLEY
INDUSTRIAL COATINGS
are
QUALITY COATINGS

There is a tingle of pride in the creation of products finished with Stanley Coatings. They add charm and prestige to the finished article. They are designed to meet each manufacturer's individual requirements and are the very best that present-day knowledge and ingenuity, combined with a modern plant, can produce.

We will welcome the opportunity of demonstrating the Quality of Stanley Coatings.

THE STANLEY CHEMICAL COMPANY
EAST BERLIN, CONN.
LACQUERS • ENAMELS • SYNTHETICS • JAPANS
A Subsidiary of THE STANLEY WORKS, New Britain, Connecticut

"PRODUCTION SAVINGS NEARLY HALF"

NEW BOOKLET ON AMERICAN BONDED METALS SHOWS HOW YOU, TOO, CAN SAVE—WRITE NOW FOR FREE COPY

PRE-FINISHED American *Bonded* Metals for modern design—for *big* production economies. Our interesting and valuable new booklet gives full details and illustrates many outstanding examples. Write for it now—no cost or obligation.

AMERICAN NICKELOID COMPANY
8 SECOND STREET, PERU, ILLINOIS
Sales Offices in All Principal Cities

Mall TRADE MARK **FLEXIBLE SHAFT EQUIPMENT**

A Style and Size for Every Production Grinding, Polishing, or Sanding Job!

These efficient tools are cutting costs and stepping up production in hundreds of industries. They deliver the maximum horsepower to the working tool with the minimum of weight in the operator's hands. Each unit is designed with heavy duty ball bearing motors and ball bearing hand spindles.

If quality-improving, labor-saving tools interest you, it will pay you to investigate MALL equipment for your 1938 production program. Our engineers are ready to assist you in selecting the right type of tool for your work.

MALL TOOL COMPANY
7756 South Chicago Avenue, Chicago, Illinois
OFFICES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Fifty Years of Polishing Material Manufacture

E. Reed Burns Manufacturing Corporation, 21-27 Jackson St., Brooklyn, N. Y., celebrates in 1938, the completion of its 50th year to the metal polishing and buffing trade. In 1888, E. Reed Burns started a small shop under the Brooklyn Bridge, making only Crocus and the then new Vienna lime compounds for stove manufacturers. His production soon increased to include all supplies of polishing and plating. The business was moved to Brooklyn in 1892 and located at 40-42 Withers Street. Later property was purchased and then all of the manufacturing departments were located at 21-27 Jackson Street, the present address. The original building on Withers Street is being used as a warehouse. The company has been under family management since its beginning and now specializes in the production of all types of compositions as well as polishing and buffing wheels.

Welding Meeting

On March 21st to 25th, 1938, the Pacific Coast Section of the American Welding Society will have meetings and programs in conjunction with the American Society of Metals at the Biltmore Hotel, Los Angeles, Calif. On these dates The Western Metals Exposition and Congress will be in session and the Pacific Coast will probably see the largest assembly of metal and welding experts ever held in a Western State area. The American Society of Metals will, of course, have many prominent delegates who are experts on heat treating, composition, structure, and uses of metals and are also experts on various phases of welding procedure.

Welding Lecture Course

American Welding Society, 33 W. 39th Street, New York, announces a lecture course for 1938 on the fundamentals of welding to be held at the Polytechnic Institute of Brooklyn, N. Y.

Full details can be obtained from the secretary at the above address.

Courses in Electroplating

Dr. C. B. F. Young will offer two courses in electroplating and electrochemistry research at Columbia University during the Spring session. Registration will begin January 31 and continue to February 5, 1938. The first meeting will be held February 2, 1938.

Chemical Engineering e84 "Practical Electroplating." This course is designed to give the practical electroplater a study of ways and means of obtaining better deposits by applying the latest scientific methods of electrochemistry to electroplating. One hour of each evening is devoted to a lecture by the instructor and the remaining two hours are devoted to the application of these principles by the student in the laboratory.

In order to take care of students who desire further training, *Chemical Engineering e86, "Investigation of Special Problems in Electrochemistry"* has been established. The

course is designed to give the practical electroplater or electrochemist a chance to investigate certain problems which are related to his field of work. One half hour of each evening is devoted to a conference with the instructor, and the remaining two and one-half hours are spent in the laboratory where the student applies his knowledge and technique to the solving of problems which arise in such an investigation.

FOR MEN OUTSIDE NEW YORK CITY

The electroplating course may be taken by correspondence for those desiring education in electroplating living outside the New York area. The complete course consists of two divisions, the first giving the student a foundation in chemistry so that he will be able to comprehend the second course, which is practical electroplating. All laboratory equipment, books, notebooks, etc. are furnished with the course. Further information may be secured by writing to Dr. C. B. F. Young, Box 292, Flushing, L. I., N. Y.; telephone Flushing 9-0633.

Compliments of the Season

METAL INDUSTRY sends its best thanks and every good wish for a happy and prosperous New Year, to the following friends who were so thoughtful as to send us Christmas and New Year's Greetings.

Agate Lacquer Manufacturing Company, Long Island City, N. Y.

American Brass Company, Waterbury, Conn.

Bausch & Lomb Optical Company, Rochester, N. Y.

Bishop Paper Company, 7-11 Laight St., New York City.

Cincinnati Milling Machine Company, Cincinnati, Ohio.

Collord, Inc., 7049 Lyndon Avenue, Detroit, Mich.

General Electric Company, Schenectady, N. Y.

Joseph Haas, 44 Fairfield Avenue, S. Norwalk, Conn.

Handy & Harman, 82 Fulton Street, New York City.

Chas. W. Hardy, 63-53—83rd St., Forest Hills, W., L. I.

George B. Hogaboom, Hanson-Van Winkle-Munning Company, Matawan, N. J.

C. M. Hoke, 136 Liberty Street, New York City.

Marmon Herrington Company, Inc., Indianapolis, Ind.

New York Testing Laboratories, 80 Washington St., New York.

Chas. H. Proctor, Proctor Chemical Company, Clearwater, Florida.

Reynolds Electric Company, 2646 W. Congress St., Chicago, Ill.

Sam Tour, 47 Fulton Street, New York City.

Tutrone Printing Company, 45 Rose St., New York City.

O. S. Tyson & Company, 230 Park Avenue, New York City.

United Engineering & Foundry Company, Pittsburgh, Pa.

Waterbury Farrel Foundry & Machine Company, Waterbury, Conn.

West Virginia Pulp & Paper Company, 30 Park Avenue, New York City.

TRADE MARK
MATCHLESS
REG. U.S. PAT. OFF.

"I HEREBY RESOLVE"

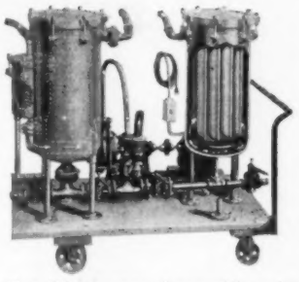
Good resolutions are now in order. Why not resolve now to actually reduce your costs by standardizing on

MATCHLESS HIGH GRADE BUFFS
BUFFING COMPOSITIONS
POLISHING WHEELS

A REAL TEST AT OUR EXPENSE
WILL PROVE THAT
There is no substitute for "MATCHLESS"

The Matchless Metal Polish Co.
840 W. 49th Pl., Chicago, Ill. 726 Bloomfield Ave., Glen Ridge, N. J.

INDUSTRIAL FILTERS FOR PLATING SOLUTIONS



Cut Illustrates Assembly with RUBBER-Lined Filter Units —DURIRON Pump & Fittings.

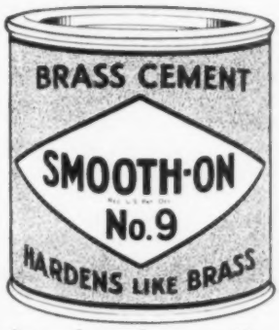
"ANNOUNCING"
NEW COMBINATION FILTER
having two separate filtering units—Operated from ONE Pump. One unit being for acid and the other for cyanide solution.

A type and size for every requirement.

Write today, for our complete price schedule, which includes specifications on filters for HOT & BRITE nickel, BRITE ZINC & CHROMIUM.

INDUSTRIAL FILTER & PUMP MFG. CO.
3017 W. Carroll Ave. Chicago, Ill.

Filling cement for BRASS and BRONZE
SMOOTH-ON NO. 9



THIS cement is easily applied, adheres and hardens well, matches the color and surface texture of the surrounding metal, and can be filed, machined or polished to a fine finish.
As a filling for holes, rough surface or porous spots on castings, and for seams, cracks and open spaces between assembled parts, this composition gives the same satisfaction on brass and bronze as do the three grades of Smooth-On No. 4 Iron Cement on iron and steel surfaces.
The first application will prove its desirability for the purposes intended, and the saving of a few otherwise rejected pieces pays for all the cement required in a year. Make the trial and be convinced. The cost is almost nothing. Get free samples and see for yourself.

Buy Smooth-On No. 9 in ¼-lb. or 2-lb. can.

SMOOTH-ON MFG. CO., Dept. 18, 568-574 Communipaw Ave., Jersey City, N. J.

Do it with SMOOTH-ON

Metal Market Review

December 30, 1937.

Copper maintained its trend of the past three months, and continued to slide, from 11½c per lb. electrolytic delivered Connecticut Valley, to 11, to 10.75, to 10.50 and then to 10.125. The reason was perfectly simple: no sales and increasing stocks of raw materials. Sales, week by week, since our last issue were: 2,736; 6,005; 5,967; 8,441; 5,501 and 3,408 tons, making a total of 30,056 tons. Statistics for November showed that stocks of refined copper in the United States increased 38,765 tons while blister stocks decreased 5,892 tons showing a net increase of 32,873 tons. Sales for November totalled 21,035 tons compared with 23,238 tons in October.

The foreign situation was very much better than the American. Refined stocks abroad decreased 8,083 tons, and blister stocks, 602 tons. Consequently export copper, although slightly lower than American metal most of the time, firmed a little toward the latter part of December and is now selling at 9.80 compared with 10,125 for United States metal.

The feeling seems to be growing that the decline is about over and that the new year should bring about either a moderate reversal of the trend of the past few months or at any rate, steadiness.

Zinc was another depressed metal. The last price quoted in these columns was 5.75c per lb. Prime Western, East St. Louis. This was reduced on November 22nd to 5.50 and followed by further reductions to 5.25 and then to 5.00 where it now rests. New business was very slow and even the price reductions did not stimulate it. November statistics were unfavorable, showing an increase in stocks of 17,167 tons. Imports of slab zinc during October amounted to 9,338 tons against 14,741 tons in September and 3,960 tons in August. Imports during the first eleven months of 1937 were 37,655 tons against 10,590 tons in the same period a year ago.

The same feeling is abroad about zinc as about copper; the worst of the decline should be over.

Lead held its ground at 4.85c per lb. St. Louis, for most of the month but the publication of the November statistics showing that refined stocks had increased 12,927 tons forced a reduction in price to 4.60. (Stocks of refined lead had increased during October by 9,904 tons). Business was consistently low throughout the month, almost all orders being for immediate delivery. Sales, week by week, since our last issue were 2,653; 4,965; 2,780; 1,216; 1,900 and 1,421 tons making a total of 14,935 compared with 20,027 tons for the previous four-week period.

Prospects are, of course, uncertain but the attitude of the market is not pessimistic.

Tin which at the time of writing our December report was selling at 42.875c per

INDUSTRIAL CLEANING MATERIALS
ULTREX
AND METHODS

ULTREX MODERN Cleaners and Solvents

for

Cold Rolled Steel — Brass and Copper
Aluminum without Etching—Die Cast and Other Metals

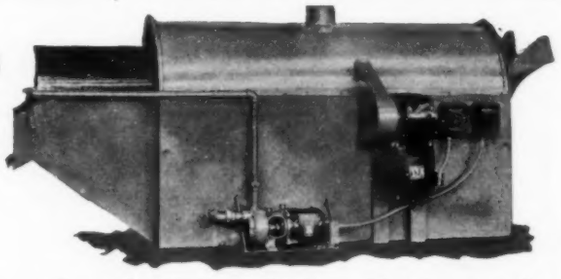
A New Scientific Achievement

BRINGS YOU BETTER AND FASTER CLEANING RESULTS

At Unusually Low Cost

ULTREX CHEMICAL PRODUCTS, Inc.
257 Freeman St. Brooklyn, N. Y.

Fewer parts rejected on inspection



This IDEAL Drum Type Continuous Washing Machine handles threaded work and delicate parts *gently*—soaks, washes, drains them—passes them along without tumbling them or dropping them. If the work is O.K. when it goes in, it's O.K. when it comes out—and it's *clean.*

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Write for complete specifications of this cost-cutting washer.

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West 71st St. at Millcreek, Carthage, Cincinnati, O.

We also manufacture drying, burnishing, plating, separating and pickling machinery.

Agateen LACQUERS

All types of Clear Lacquer for Metals

BUFFING LACQUER
for Cloisonne Reproductions
Air-Dry Priming Lacquer
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Elastic *Non-blushing*

Agate Lacquer Mfg. Co., Inc.
11-13 Forty-third Road, LONG ISLAND CITY, N. Y.

Agateen —*The Last Word in Quality*

pound Straits, had rebounded from a previous low of 41. It continued to rise as high as 45.40, and then receded to 41; now selling at 41.125. Actual consumption was of course light because of the slow rate of operations of the American tinplate mills, but the strength was due to the plans of the tin producers for curtailment of production, announcement of which was made on December 10th by the International Tin Committee to the effect that the quota for the first quarter of 1938 would be 70% of standard tonnages. A slight recession, of course, followed the announcement, the news being out.

Cadmium ended its long continued climb. Effective January 1st, 1938, the leading producer will establish its quotation for ordinary commercial forms at $1.00 per pound. According to reports the general undertone is soft.

Silver was inevitably dull because of the uncertainty of the attitude of the American administration toward domestic mined silver in the coming year. In the meantime the New York official quotation on foreign silver remained unchanged at 44.75c per ounce Troy until December 22nd, when Handy and Harman announced that in addition to the official quotation they would name an industrial base price to be used in buying and selling transactions with the arts and industry as long as the present situation exists. Their present figure is 42c.

The U. S. Treasury price for newly mined domestic silver, it was announced on Dec. 30th would be 64.64; previous price, 77.57.

Platinum continued to slide downward, selling on December 30 at $33-35 per ounce Troy; present price, $33-$35.

Scrap Metals, of course, headed in the same direction as new metals which are consistently down throughout the last six-week period. The firmness in the export market, however, was a silver lining to the clouds and offerings of scrap at this writing are hesitant—a sign of receding anxiety and growing optimism. Export copper and brass bids actually advanced during the week of December 20th.

Calls for brass and aluminum ingot were very poor, sales and deliveries being low. Unfilled orders on the books of members of Non-Ferrous Ingot Metal Institute amounted to 13,936 tons on December 1st compared with 15,557 tons on November 1st and 18,641 tons on October 1st. The combined deliveries of brass and bronze ingots and billets of members for the month of November amounted to 3,805 tons compared with 5,430 tons in October and 6,683 tons in September.

The Institute reports the average prices per pound received by its members on commercial grades of six principal mixtures of ingot brass during the 28-day period ending Nov. 26th and Dec. 24th as follows:

	4 wks. end. Dec. 24	4 wks. end. Nov. 26	4 wks. end. Oct. 29
88-10-10	12.864	13.017	14.732
70% Metal	10.321	10.267	11.719
85% Metal	10.527	10.511	12.170
83% Metal	11.001	10.934	12.142
80% Metal	11.102	11.395	12.743
No. 1 Yellow	9,205	9.120	10.004

ACIDPROOF FLOORS

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PLATING ROOMS

FULTON ASPHALT CO.

BUILDERS BUILDING

CHICAGO

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COMPOUNDS

STAINLESS STEEL

is polished to a Mirror-Like finish with Oriental Compounds. Rouges and Compositions for Gold, Sterling, Silver Plate and other metals. They produce a durable and economical finish.

We invite your inquiry.

Oriental Rouge Co., Inc.

Established 1901

FACTORY: 66-68 PINE STREET BRIDGEPORT, CONN.

Average Prices for Metals

	Nov.
COPPER c/lb. Duty 4c/lb.	
LAKE (del. Conn. Producers' Prices)	11.715
ELECTROLYTIC (del. Conn. Producers' Prices)	11.022
CASTING (f.o.b. ref.)	10.564
ZINC (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05-0.10)	5.632
TIN (f.o.b. N. Y.) c/lb. Duty Free, Straits	43.303
LEAD (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	4.883
ALUMINUM c/lb. Duty 4 c/lb.	20.000
NICKEL c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.000
ANTIMONY (Ch.) c/lb. Duty 2 c/lb.	15.914
SILVER c/oz. Troy, Duty Free	44.75
PLATINUM $/oz. Troy, Duty Free	41.842
GOLD—Official U. S. Treasury Price $/oz. Troy	35.000

	Dec.
COPPER c/lb. Duty 4c/lb.	
LAKE (del. Conn. Producers' Prices)	11.062
ELECTROLYTIC (del. Conn. Producers' Prices)	10.236
CASTING (f.o.b. ref.)	9.753
ZINC (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05-0.10)	5.011
TIN (f.o.b. N. Y.) c/lb. Duty Free, Straits	42.854
LEAD (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	4.725
ALUMINUM c/lb. Duty 4 c/lb.	20.000
NICKEL c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.000
ANTIMONY (Ch.) c/lb. Duty 2 c/lb.	14.693
SILVER c/oz. Troy, Duty Free	43.810
PLATINUM $/oz. Troy, Duty Free	36.022
GOLD—Official U. S. Treasury Price $/oz. Troy	35.000

Supply Prices, January 5, 1938

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast ..... 20⅝c. per lb.
Electrolytic, full size, 15⅝c. cut to size .. 15⅝c. per lb.
Rolled oval, straight, 16⅛c.; curved .... 17⅛c. per lb.
BRASS: Cast ..... 19⅜c. per lb.
ZINC: Cast ..... 11¾c. per lb.

NICKEL: 90-92%, 16" and over ..... .45 per lb.
95-97%, 16" " " ..... .46 per lb.
99%+cast, 16" and over, 47c.; rolled, depolarized, 16" and over, 48.
SILVER: Rolled silver anodes .999 fine were quoted Jan. 6, from 48c. per Troy ounce upward, depending on quantity.

White Spanish Felt Polishing Wheels

Diameter	Thickness Under ½"	½-15/16"	1-2"	2-3½"	Over 3½"
Under 1"	6.35-6.40	6.20-6.25	6.10-6.15	6.10-6.15	6.35-6.40
1" to 1 7/16"	5.85	5.70	5.60	5.60	5.85
1½" to 3 15/16"	5.55	5.35-5.40	5.30-5.35	5.30-5.35	5.60
4-5 15/16"	4.95-5.00	4.70-4.85	4.65-4.75	4.65-4.75	4.95-5.00
6", 8" & 9"	3.80-4.25	3.45-3.95	2.45-3.05	2.45-3.00	2.90-3.35
10" to 18"	3.80-4.25	3.45-3.95	2.45-2.95	2.45-2.85	2.90-3.25
Over 18"	3.80-4.25	3.45-3.95	2.70-3.05	2.70-3.00	2.90-3.35

Prices above are for less than 50 lb. For 50 to 99 lb. deduct from 30c per lb. to 5% from list; for 100 lb. and over deduct from 50c per lb. to 10%.

ODD DIAMETERS: (7" & 11" to 17"). Less than 50 lb. add 40c per lb. to above "Even Diameters" list. 50 lb. or over—all one size and consistency and in one shipment—same as "Even Diameters" list above.

On grey Mexican wheels deduct 10c per lb. from above prices.

Cotton Buffs

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$75.24
14" 20 ply 84/92 Unbleached	57.67
12" 20 ply 84/92 Unbleached	43.28
16" 20 ply 80/92 Unbleached	63.28
14" 20 ply 80/92 Unbleached	48.57
12" 20 ply 80/92 Unbleached	36.52
16" 20 ply 64/68 Unbleached	59.69
14" 20 ply 64/68 Unbleached	45.84
12" 20 ply 64/68 Unbleached	34.49

⅜" Sewed Buffs, per lb., bleached or unbleached 54c to 90c

Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

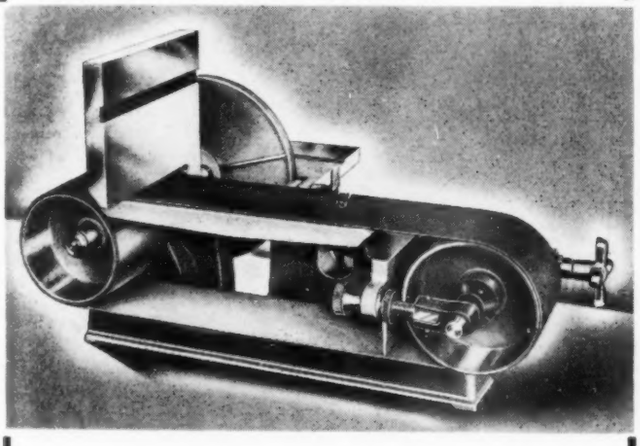
Acetone C. P. l.c.l. Drums	lb.	.06¼
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 100 lb. and 400 lb. drums		.16¾-.17¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.027
Hydrochloric, C. P., 20 deg., carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07½
Sulphuric, 66 deg., carboys	lb.	.02½
Alcohol—Butyl, drums (f.o.b. destination)	lb.	.10-.10½
Denatured, carloads (f.o.b. prod. pts.)	gal.	.35-.40
Alum—Lump, barrels	lb.	.0340-.0365
Powdered, barrels	lb.	.0355-.0380
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05¼
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0255-.0305
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.35
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05¾-.06
Chrome, Green, commercial, bbls.	lb.	.22
Chromic Sulphate, drums	lb.	.26¼
*Copper—Acetate (Verdigris)	lb.	.25
Carbonate, 53/55% cu., bbls.	lb.	.15¼-.16¼
Cyanide (100 lb. kgs.)	lb.	.37
Sulphate, tech., crystals, bbls.	lb.	.052
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium 41%		$15.45
*Gold Cyanide, Sodium 46%		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead—Acetate (Sugar of Lead), bbls.	lb.	.11-.13¾
Oxide (Litharge), bbls.	lb.	.12½
Lime Compositions for Nickel	lb.	.09½-.11
Lime Compositions for Brass	lb.	.09½-.11
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums l.c.l.	gal.	.40½
Nickel—Carbonate, dry bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 98-100%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.36½
Cyanide, 100 oz. lots	oz.	.39¼-.42
Nitrate, 100 ounce lots	oz.	.31½
Soda Ash, 58%, bbls.	lb.	.0235
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.15
Nitrate, tech., bbls.	lb.	.0325
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.28-.31
Sulphocyanide, drums	lb.	.30-.35
Sulphur (Brimstone), bbls.	lb.	.02¾
*Tin Chloride, 100 lb. kegs	lb.	.34
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
White Silica Compositions for Brass	lb.	.07½-.10
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.14-.15
Cyanide (100 lb. kegs)	lb.	.36
Chloride, drums, bbls.	lb.	.08
Sulphate, bbls.	lb.	.0405

*Subject to fluctuations in metal prices.

Metal Prices on page 60.

TAKE YOUR
BIG MACHINES
OFF
YOUR SMALL JOBS!

Here's a machine built to do your small jobs as they should be done—economically! Its makers have specialized in small precision shop equipment for years.



This "700 Series" Belt-and-Disc Sander at $29.95 (less motor) provides a quick, inexpensive method of touch-up and finishing. Every man in the finishing department of your plant needs one at his right hand. Your Walker-Turner Dealer will demonstrate, or send for the catalog. Walker-Turner Co., Inc., 3418 Berckman St., Plainfield, N. J.

WALKER-TURNER
Engineered **POWER TOOLS**

Besplate
NICKEL ANODES

ARE QUALITY PRODUCTS . . .

LEADERS in the Nickel Plating Industry have standardized on McGean Besplate 99% Nickel Anodes — Because

1. Cathode Deposits are smoother
2. Anode corrosion is excellent
3. Less frequent filtering of solution required

◆◆◆◆◆

We Also Offer

Genuine Rolled Oval
Depolarized Nickel Anodes

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From our complete line of Anodes and Plating Chemicals we call your attention to the following:

ANODES

Nickel (all percentages)	Tin
Copper	Brass
Cadmium	Zinc

CHEMICALS

Nickel Salts	Copper Sulphate
Nickel Chloride	Copper Cyanide
Nickel Carbonate	Copper Carbonate
Chromic Acid	Cadmium Oxide

Manufactured by

THE McGEAN CHEMICAL COMPANY
CLEVELAND, OHIO

McGEAN CHEMICALS

Metal Prices, January 5, 1938

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

New Metals

COPPER: Lake, 11.00, Electrolytic, 10.25, Casting, 9.775.
ZINC: Prime Western, 5.00. Brass Special, 5.10.
TIN: Straits, 42.00. LEAD: 4.60.
ALUMINUM: 20. ANTIMONY, Am. 13.75.
NICKEL: Shot, 36. Elec., 35.

QUICKSILVER: Flasks, 75 lbs., $83. BISMUTH, $1.00.
CADMIUM, $1.35. SILVER, Troy oz., official price, N. Y., Jan. 6, 44¾c.
GOLD: Oz. Troy, Official U. S. Treasury price $35.00.
SCRAP GOLD, 6¾c. per pennyweight per karat, dealers' quotation.
PLATINUM, oz. Troy $40-42.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Ingot Metals and Alloys

	Cents lb.	U. S. Import Duty	U. S. Import Tax*
No. 1 Yellow Brass	9.25	None	4c. lb.[1]
85-5-5-5	11.25	None	4c. lb.[1]
88-10-2	14.75	None	4c. lb.[1]
80-10-10	13.00	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	11.25	None	4c. lb.[1]
Aluminum Bronze	15.50	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	13.25	20% a. v.	4c. lb.[1]
Nickel Silver (15% Ni)	15.50	20% a. v.	4c. lb.[1]
No. 12 Aluminum	16.75-19	4c. lb.	None
Manganese Copper, Grade A (30%)	24-29	25% a. v.	3c. lb.[1]
Phosphor Copper, 10%	15.50	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	16.50	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	22.00	45% a. v.	4c. lb.[1]
Phosphor Tin, no guarantee	58-68	None	None
Iridium Platinum, 5% (Nominal)	$40.25	None	None
Iridium Platinum, 10% (Nominal)	$42.50	None	None

* Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1] On copper content. [2] On total weight. "a. v." means ad valorem.

Old Metals

Dealers' buying prices, wholesale quantities:	Cents. lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	6¾ to 6⅞	Free	4c. per pound on copper content
Light copper	5⅞ to 6⅛	Free	
Heavy yellow brass	4½ to 4⅝	Free	
Light brass	3¼ to 3½	Free	
No. 1 composition	6⅜ to 6⅝	Free	
Composition turnings	5⅝ to 5⅞	Free	
Heavy soft lead	3¾ to 4	2⅛c. lb.	None
Old zinc	2½ to 2¾	1½c. lb.	
New zinc clips	3¼ to 3½	1½c. lb.	
Aluminum clips (new, soft)	13½ to 14	4c. lb.	
Scrap aluminum, cast	8½ to 9	4c. lb.	
Aluminum borings—turnings	6½ to 6¾	4c. lb.	
No. 1 pewter	21 to 23	Free	
Electrotype	4¼ to 4½	2⅛c. lb.*	
Nickel anodes	29 to 30	10%	
Nickel clips, new	30 to 31	10%	
Monel scrap	7½ to 13½	10% av.	

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since Nov. 23, 1937. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

Copper Material

	Net base per lb.	Duty*
Sheet, hot rolled	19⅛c.	2½c. lb.
Bare wire, soft, less than carloads	15⅛c.	25% a. v.
Seamless tubing	19⅝c.	7c. lb.

* Each of the above subject to import tax of 4c. lb. in addition to duty under Revenue Act of 1932.

Nickel Silver

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	27¼c.	10% Quality	29⅞c.
15% Quality	29⅜c.	15% Quality	34¼c.
18% Quality	30⅝c.	18% Quality	37½c.

Brass and Bronze Material

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	17⅜c.	18¼c.	19⅛	4c. lb.	U. S. Import Tax 4c. lb. on copper content.
Wire	17⅝c.	18½c.	19⅜	20%	
Rod	13⅜c.	18½c.	19¼	4c. lb.	
Angles, channels	25⅞c.	26¾c.	27⅝	12c. lb.	
Seamless tubing	20⅛c.	20¾c.	21½	8c. lb.	
Open seam tubing	25⅞c.	26¾c.	27⅝	20% a. v.	

Tobin Bronze and Muntz Metal

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	19¼c.
Muntz or Yellow Rectangular and other sheathing	20⅝c.
Muntz or Yellow Metal Rod	16¾c.

Aluminum Sheet and Coil

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, carload lots, per lb.	33.00c.
Aluminum coils, 24 ga., base price, carload lots, per lb.	28.50c

Rolled Nickel Sheet and Rod

Net Base Prices

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

Monel Metal Sheet and Rod

Hot Rolled Rods (base)	35c.	No. 35 Sheets (base)	37c.
Cold Drawn Rods (base)	40c.	Std. Cold Rolled Sheets (base)	39c.

Silver Sheet

Rolled sterling silver (Jan. 6) 47c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

Zinc and Lead Sheet

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots standard sizes and gauges, at mill, less 7 per cent discount	10.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' prices)	11.50	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' prices)	15.50	2c. lb.
Full Lead Sheet (base price)	8.00	2⅝c. lb.
Cut Lead Sheet (base price)	8.25	2⅝c. lb.

Block Tin, Pewter and Britannia Sheet

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 58.

cadalyte

REG. U. S. PAT. OFF.

The Complete Salt for Cadmium Plating

For brilliant, ductile deposits without bright dipping, use CADALYTE, the du Pont cadmium plating salt. Deposits of 100% cadmium obtained with CADALYTE give maximum rust protection with minimum of metal. ▾ The bath is prepared simply by adding CADALYTE to water, and is easily maintained. It is stable, operates at room temperature, accommodates high current densities, and has high current efficiencies and throwing power. This gives rapid plating at lowest cost. ▾ Cadmium anodes are available in all standard shapes and sizes.

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E. I. DU PONT DE NEMOURS & CO., INC.
Electroplating Division - Wilmington, Del.

DU PONT
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Chemicals and Processes for Electroplating . . . .
CADMIUM, COPPER, CHROMIUM, NICKEL, TIN, ZINC, BRASS, GOLD and SILVER.

Founded January, 1903 by
PALMER H. LANGDON
1868-1935

METAL INDUSTRY

VOLUME 36 **FEBRUARY, 1938** **NUMBER 2**

Publication Office:
116 John Street, New York

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PUBLISHED MONTHLY—Copyright 1938 by The Metal Industry Publishing Company, Incorporated, 116 John St., New York, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1897.

SUBSCRIPTION PRICES: United States and Canada, $2.00 Per Year; Foreign $4.00. Single copies, 20 CENTS. Please remit by check or money order; cash should be registered.

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